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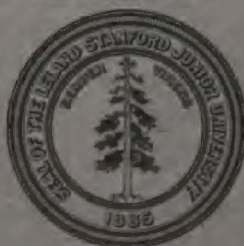
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THE NEW SYDENHAM SOCIETY.

INSTITUTED MDCCCLVIII.

VOLUME CXXIII.

A

TEXT BOOK OF MIDWIFERY.

BY THE LATE

OTTO SPIEGELBERG,

Professor of Obstetric Medicine in the University of Breslau.

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TRANSLATED FROM THE SECOND GERMAN EDITION

BY

J. B. HURRY, M.A., M.D., Cantab.

(IN TWO VOLUMES.)

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TABLE OF CONTENTS OF VOL. II.

PART III.

(Continued.)

CHAP. II.—THE PATHOLOGY OF LABOUR.

	PAGE
A. Difficult Labour	8
1. Anomalies in the Expelling Forces	8
<i>a.</i> "Too feeble" pains	5
<i>b.</i> "Too strong" pains—precipitate labour	16
<i>c.</i> Spasmodic pains.....	20
2. Deformities of the Pelvis	25
1. Contracted pelves—definition, frequency	27
2. Diagnosis of contracted pelves—pelvimetry	29
(1.) External measurement.....	32
(2.) Internal measurement	36
3. The three principal forms of contracted pelvis.....	41
<i>a.</i> Description and diagnosis	41
(1.) The ordinary flat pelvis	41
(2.) The generally and uniformly contracted pelvis	51
(3.) The generally contracted, flat pelvis.....	55
<i>b.</i> Course of labour	58
<i>c.</i> Sequelæ for mother and fœtus	77
<i>d.</i> Treatment	82
4. Rare forms of contracted pelvis.....	91
<i>a.</i> The contracted infundibuliform pelvis.....	91
<i>b.</i> The obliquely contracted pelvis.....	93
<i>c.</i> The transversely contracted pelvis	105
(1.) The bilaterally synostotic or Robert's pelvis	105
(2.) The kyphotic pelvis	107
<i>d.</i> The tri-radiate pelvis	112
(1.) The osteo-malacic pelvis.....	112
(2.) The tri-radiate rachitic pelvis	118
<i>e.</i> The spondylolisthetic pelvis	119
<i>f.</i> Pelvic deformity due to dislocation of the femur	124
<i>g.</i> Pelves deformed by tumours and exostoses	128
<i>h.</i> The split pelvis.....	130
5. Anomalies of the Sexual Organs	133
<i>a.</i> Occlusion, contraction and rigidity of the parturient canal.....	134
(1.) Of the cervix uteri	134
(2.) Of the vagina.....	138
(3.) Of the vulva	141

	PAGE
<i>b. Tumours</i>	143
(1.) Myoma of the uterus.....	143
(2.) Polypi of the uterus.....	148
(3.) Enlargement of the anterior lip of the cervix	148
(4.) Cancer of the cervix	149
(5.) Ovarian tumours	152
(6.) Vaginal hernia.....	154
(7.) Dystocia caused by the bladder	156
<i>c. Anomalies of the Fœtus and its Appendages</i>	160
<i>a. Abnormal size and conformation</i>	160
(1.) Excessive development of the fœtus.....	160
(2.) Enlargement due to dropsy and emphysema	164
(3.) Circumscribed enlargement of the fœtus.....	165
(<i>a</i>) Hydrocephalus	165
(<i>b</i>) Hydrothorax and enlargement of the abdomen	169
(<i>c</i>) Tumours situated on the surface.....	170
(4.) Monstrosities	172
(<i>a</i>) Double monsters	172
(<i>b</i>) Other monstrosities	176
<i>b. Abnormal presentations, trunk or transverse presentations</i>	178
<i>c. Abnormal position and attitude</i>	193
(1.) Prolapse of the arm	193
(2.) Prolapse of the foot	197
<i>d. Anomalies of the fetal appendages</i>	198
(1.) Anomalies of the fetal membranes	198
(2.) Anomalies of the liquor amni	201
(3.) Anomalies of the umbilical cord	201
<i>B. Labour Associated with Dangerous Complications</i>	204
1. Puerperal Eclampsia	204
2. Hemorrhage from the Uterus	226
(1.) Atony of the uterus	230
(2.) Stricture of the uterus	246
(3.) Retention of the placenta	248
(4.) Removal of the placenta from the uterus	253
3. Inversion of the Uterus	249
4. Lacerations, Perforations and Ruptures of the Parturient Canal	270
<i>a. Lacerations of the uterus</i>	270
(1.) Ruptures	271
(2.) Injuries due to the uterine walls being rubbed through	291
(3.) Tears of the portio vaginalis	293
<i>b. Tears of the vagina</i>	296
(1.) Tears of the upper portion of the vagina	296
(2.) Lacerations of the middle portion of the vagina	299
(3.) Vaginal fistule	301
<i>c. Tears at the vaginal introitus and vestibule</i>	303
<i>d. Ruptures of the perineum</i>	306
<i>e. Thrombus, hæmatoma of the vagina and vulva</i>	314
<i>f. Rupture of the pelvic articulations</i>	321
5. Disorders Connected with the Umbilical Cord	328
<i>a. Ruptures of the umbilical cord</i>	328
<i>b. Prolapse of the umbilical cord</i>	330
6. Tympanites Uteri, Pylæmetria	344
7. Collapse after Delivery. Sudden Death during Labour and the Puerperal State	347
8. Death of the Child during Delivery. Asphyxia Neonatorum	356

TABLE OF CONTENTS OF VOL. II.

vii

PAGE

CHAP. III.—THE PATHOLOGY OF THE PUERPERAL STATE.

1. Anomalous Involution	875
<i>a.</i> Anomalous after-pains	875
<i>b.</i> Anomalies of the lochial secretion	876
<i>c.</i> Hæmorrhage from the uterus	878
<i>d.</i> Venous thrombosis of the lower limbs (<i>Phlegmasia alba dolens</i>)	882
2. Affections of the Bladder and Urethra	890
<i>a.</i> Cystitis	890
<i>b.</i> Neuroses	898
(1.) Spasm of the bladder	898
(2.) Retention of urine	894
(3.) Incontinence of urine	896
3. Neuralgia and Paresis of the Lower Limbs	896
4. Disorders of Lactation	899
<i>a.</i> Galactorrhœa	899
<i>b.</i> Sore nipples	401
<i>c.</i> Inflammation of the breast, mastitis	408
<i>d.</i> Galactocele	411
5. Puerperal Insanity	418
<i>a.</i> During pregnancy	415
<i>b.</i> During labour	416
<i>c.</i> During the post-partum state	416
<i>d.</i> During lactation	419
6. Traumatic Diseases, Puerperal Fever	420
<i>a.</i> Pathology and ætiology	420
<i>b.</i> Post-mortem appearances and varieties of the disease	484
<i>c.</i> Symptoms and progress	449
<i>d.</i> Prophylaxis and treatment	461
<i>a.</i> Puerperal infection of new-born children	476
7. Puerperal Tetanus	482

PART IV.

OBSTETRICAL OPERATIONS.

Introductory Remarks	485
1. The Induction of labour before the Full Term of Gestation	488
<i>a.</i> The induction of premature labour	488
<i>b.</i> Artificial abortion	501
2. Version	505
<i>a.</i> External version	509
<i>b.</i> Combined or Bipolar version	511
<i>c.</i> Internal version	515
3. Extraction by the Pelvic Extremity	528
<i>a.</i> Podalic extraction	529
<i>b.</i> Extraction by the breech	541
<i>c.</i> Injuries to the child which occur during artificial pelvic extraction	546
4. Forceps Operations	553
5. Perforation and Extraction of the Head of the Fœtus, Craniotomy	579
<i>a.</i> Perforation	586
<i>b.</i> Extraction	590
6. Embryotomy	601
7. Cæsarian Section	607
Appendix : Forced delivery	625
Index	627

ILLUSTRATIONS OF VOL. II.

FIG.		PAGE
76.	Schultze's callipers	33
77.	Matthien's callipers	33
78.	Normal inclination of the symphysis	34
79.	Unusually horizontal symphysis	34
80.	Steep symphysis	39
81.	Section through normal pelvis	42
82.	Section through ordinary flat pelvis	42
83.	Section through rickety flat pelvis	43
84.	Section through generally and uniformly contracted pelvis	43
85.	Simple flat pelvis	44
86.	Rickety flat pelvis	44
87.	Rickety flat pelvis	49
88.	Dwarf pelvis	52
89.	Generally, uniformly contracted pelvis	53
90.	Generally contracted, flat pelvis	55
91.	Generally contracted, flat rickety pelvis	57
92.	Fore-vertex presentation	69
93.	Obliquely contracted pelvis of Nægele	94
94.	Obliquely contracted, synostotic pelvis	94
95.	Pelvis, showing disease of the hip-joint on the right, and contraction and distortion on the left, side	90
96.	The transversely contracted pelvis of Robert	105
97.	The Zurich kyphotic pelvis	108
98.	Stadfeldt's kyphotic and roofed-in pelvis	111
99.	Osteo-malacic pelvis (early stage)	115
100.	Osteo-malacic pelvis	115
101.	Rachitic pelvis, attacked by osteo-malacia	119
102.	Spondylolisthetic pelvis	120
103.	Spondylolisthetic pelvis	121
104.	Pelvis, with dislocation of both femora	125
105.	Retro-cervical subserous myoma	146
106.	Transverse presentation, before dilatation of the os	179
107.	} Illustrating the various stages of spontaneous evolution	188
108.		
109.		
110.		
111.	Delivery corpore con duplicato	189
112.	} Showing various degrees of inversion of the uterus	259
113.		
114.		
115.	Abnormal relations of the uterus and cervix with a head presentation	274
116.	Abnormal relations of the uterus and cervix with a shoulder presentation	274
117.	Transverse rupture through uterus	276

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FIG.	PAGE
118. Diagram of perineal ruptures	808
119. Sutures in sewing up the perineum.....	312
120. Murphy's repositor	342
121. Curve showing prevalence of puerperal fever at different seasons of the year	431
122. Uterus, from a case of puerperal fever.....	439
123. Temperature chart of acute lymphatic septicæmia	451
124. Temperature chart of lymphatic septicæmia	451
125. Temperature chart of phlebotic septicæmia	452
126. Internal version.....	528
127. Bimanual method of version, with head presentation	526
128. Bimanual method of version, with transverse presentation	526
129. Trefurt's porte-fillet	527
130. Smellie's blunt hook	543
131. Chamberlen's forceps	554
132. Palfyn's forceps.....	554
133. Levret's forceps.....	555
134. Smellie's forceps	555
135. Trefurt's forceps	555
136. Tarnier's forceps	556
137. Nægele's perforator	586
138. Blot's perforator	586
139. Trephine of Leisnig, modified by Kiwisch	587
140. Trephine of Pajot.....	587
141. Busch's cephalothryptor	593
142. Braun's cranioclast	594
143. Braun's decapitating hook	602

PART III.

(Continued.)

CHAPTER II.—THE PATHOLOGY OF LABOUR.

§ 445. We have already, in PART TWO, mentioned the conditions which must be fulfilled, if a labour is to run a normal course. The most important amongst them is that the propelling force and the obstruction to be overcome shall bear a proper relation to one another in regard to the circumstances of the particular case. When one of these factors deviates from the average, an abnormality is present. Such abnormality almost always arises from an undue weakness of the expulsive forces in comparison to the obstruction they have to overcome, and this leads to *difficult labour*. Occasionally the opposite condition obtains; but for the present we may disregard the rare cases of too easy delivery (which moreover have but little practical significance), the description of which will be given with that of difficult labour at the proper place, and state that *difficult labours form one principal group of abnormal deliveries*. The difficulty may arise from anomalies of the expulsive forces, or from undue resistance on the part of the pelvis and soft parturient passages (contraction), or of the fœtus (irregular conformation, presentation &c.). Each of these causes must be separately discussed.

But the progress of parturition may also be interfered with, even when the mechanical conditions are favourable, by complications which, without directly affecting the latter, greatly imperil the life of the mother, that of the child, or both. Such complications are sometimes accidental, but are more often associated with the pregnant condition, particularly with labour. They mainly include convulsions, hæmorrhæge, lacerations of the parturient passages, prolapse of the cord &c. *Complications of this kind give rise to a second principal group of abnormal deliveries*.

§ 446. It is always difficult to draw the line between health and disease, and in regard to parturition the same difficulty

arises; indeed not infrequently it is very far from easy to decide what is normal and what abnormal. In such cases the question must be settled by practical considerations, i.e. by the influence which the course of labour is exerting on mother and child. On a timely recognition of such influence will depend the attainment, or otherwise, of that which is the great object of midwifery, viz. the protection and preservation from injury of both the organisms concerned. It is more difficult to select the *right moment* for interference than the method to be adopted, and the dictum "*occasio præceps*" is nowhere of more importance than here, since an opportunity that has been neglected rarely returns, while untimely measures are often severely punished by the consequences. Where there is room for choice, the gentlest measures should invariably be tried first, operations being deferred as long as possible. It is true that prolonged expectancy and watchfulness demand much time and patience, requisites which the circumstances of professional life do not always supply; but it must never be forgotten that medical assistance must be such in fact, not merely in name, and not involve fresh risks which might be avoided. Statistics (Dohrn, *Archiv f. Gynækologie*, iii., p. 282, and vi., p. 321) show that the maternal and foetal mortality are not lowest, where operations are most frequently resorted to.

A. Difficult Labour.

1. Anomalies of the Expelling Forces, Anomalous Pains.

§ 447. The expelling forces are supplied by *contractions of the uterus* and by the *abdominal pressure*.

A consideration of the latter is of great importance under normal circumstances, but it is still more so in abnormal labour. The *abdominal muscles* may act voluntarily or in a reflex manner, and are therefore liable to far greater variations than is the uterine muscle. All the varieties however fall into one of three categories: too weak, too strong or too irregular contractions.

The anomalies of the *uterine contractions* are much more difficult to define. So long as a muscle is healthy, its activity will be normal; abnormal innervation can only cause irregularity to the extent that without proper innervation the muscle does not act at all, and of such a condition there is no question in the case of the parturient uterus. *Primary* anomalies of its contractility can therefore only depend on disease of its parenchyma, and the latter will simply cause the manifestation of activity to be abnormally weak or irregular, or to be associated with undue suffering. But anomalous pains caused by changes in the uterine parenchyma (apart from a state of exhaustion) are extraordinarily rare.

The degree of pressure exerted by a "pain" is determined by the obstruction which it has to overcome; in a healthy uterus the energy of the contractions will rise and fall with that obstruction. If this relation is altered, if the force of the pains is not in proportion to the degree of obstruction, or if the latter is so great that during the intermissions the alteration in the form of the uterus which accompanied the pain, is every time again lost, an anomaly is indeed present; but, as must never be forgotten, it then lies in the abnormal obstruction and not in the uterine contractions.

The condition however is different, where no general intra-uterine pressure exists, and where therefore the pressure only acts

at certain points, owing to the escape of too much liquor amnii. Here the uterine muscle does not sufficiently recover itself during the intermission; the obstruction which the contraction encountered, continues to act during the intermission as an antagonistic force, and undoes the "restitution of form" (cf. vol. i., p. 190) which had been striven after and attained during the "pain"; the fresh arrangement of the muscular fibres which was effected during the latter is not maintained, and the stimulus to a more and more vigorous evolution of force is not forthcoming. Hence results *uterine inertia*. To this must be added the abnormal configuration of the uterus, which necessarily results from too copious a discharge of liquor amnii; this also interferes with a normal action of the pains, leads to localised hyperæmia and inflammation, and thus to localised contraction and spasm of the uterus, and finally brings about a condition in which the irritated muscle remains permanently contracted, and the pains therefore are completely ineffectual.

§ 448. If all these processes are carefully considered, no doubt will be felt that it is only a diseased or exhausted muscle, and the escape of an excessive quantity of liquor amnii that really produce anomalous pains, leading to inertia in the first place, then to partial and spasmodic contractions. But *clinically* pains will always be estimated according to the effect they produce, i.e. to their effect on the obstruction; and if therefore in what follows we also speak of too strong pains, it must not be forgotten that pains never are absolutely too strong, that they only appear to be so, in consequence of the resistance being inadequate or of some injurious result being produced. Since the following description is to be a clinical one, abnormal conditions of the abdominal muscles will be discussed simultaneously in the appropriate sections.

Lastly, I may point out that the more the practitioner has learnt to connect the influence of the obstruction to the expulsive forces with their mode of appearance and character, the more he can in practice analyse the varieties he meets with, the more rarely will he meet with "anomalous pains." He will find that in most of the cases in which the term is used, theories have been constructed in order to give the course of events an apparently scientific basis. At any rate in my practice "anomalous pains" are almost unknown.

a. "Too feeble" Pains.

§ 449. It follows from what has been stated above, that pains are only really "too feeble", when the *uterine muscle is unable to exert the pressure which is required at the existing stage of labour*; and this can only be the case when the *musculature is primarily ill developed or in part unfunctional, or has been too severely stretched mechanically, or lastly when it has been exhausted after too severe or prolonged work.*

When therefore the pains are observed to be so feeble, that they do not perceptibly advance the progress of labour within the ordinary time, it is in uteri which have rapidly become pregnant on successive occasions, and in which doubtless a portion of the parietes is still in a state of fatty degeneration; further occasionally in uteri in whose walls are large myomata, or where the walls have been excessively expanded by unduly bulky contents (hydramnios, multiple fœtuses). In these cases the contractions are of very short duration, the intermissions are of undue length, and the wall undergoes but little hardening during the pains.

But the contractility may also be injuriously affected by *inflammatory affections of the parenchyma*, in consequence of which the contractions cause the woman great suffering, and which render the organ so irritable, that it does not properly relax during the diastole, but remains more or less contracted. In this way the repose during the diastole, which the muscle needs for its further activity, is lost; the latter is not fully developed and the efficiency of the pain is diminished.

We have stated above how the *discharge of an excessive quantity of liquor amnii* leads to uterine inertia. *Anomalous configuration* acts by every contraction leading to an anomalous disposition of the uterine fibres. The most marked instances of this condition, which is so often seen in practice, are due to a dilated bladder, which causes the anterior uterine wall to bulge inwards, or to an accumulation of feces in the great intestine, which flattens the posterior and lateral uterine surfaces.

I have never been able to discover the *psychical influence* on "pains", which is so often spoken of in practice, but on the contrary have always been able to explain the influence referred to in other ways.

§ 450. Inertia may also be partly due to an abnormal condition of the *abdominal pressure*. Thus if the abdominal muscles are thrown into action too soon, and especially if at the same time too vigorously, they may interfere with the original contractile force of the uterus, in consequence of the general pressure which they exert on that organ. This is more particularly seen during the first stages of labour with very painful contractions and in very sensitive persons, who continue instinctively to bear down without allowing themselves any intervals for rest.

But the abdominal pressure may also be too weak in itself at a time when it is really necessary, *i.e.* during the period of expulsion, and this may, or may not, be accompanied by normal uterine activity. The cause may either lie in the *lying-in woman not being able to bear down* (rheumatic affections of the muscle, great stretching and weakness of the latter, with diastasis of the recti), or in the *bearing down giving rise to pain* (owing to irritation and inflammation of the points at which the abdominal muscles are in immediate contact with the uterine wall) and therefore being instinctively suppressed, or lastly in the fact that the parturient woman intentionally does not help, either from *disinclination* or from a *dread of increasing the ordinary pain of labour*. I need hardly add that such an inefficient abdominal pressure will be especially troublesome, where the contractions of the uterus are feeble.

Sequelæ.

§ 451. The primary effect of uterine inertia is always to delay delivery, which delay affects both the duration of the entire process and that of the separate stages. But the importance of inertia depends mainly on the time at which it sets in, next on the mechanical relations between mother and fœtus, and lastly on the causes which lead to it.

Inertia during the *stage of dilatation* is of little consequence, so long as the bag of membranes is still intact, since the fœtus and its appendages are not under such circumstances exposed to any injurious pressure, nor are the maternal parts pressed upon for any very prolonged period. The worst effect is that the long delay in delivery may fatigue and worry the lying-in woman, by

depriving her of sleep and by its psychical influence. Whether pains that have lasted for days, may also lead to a disturbance in the placental circulation (*e.g.* to an extensive formation of thrombi in the uterine sinuses?) and thus prove injurious to the child, I must leave an open question; I have occasionally, where the first period has been unduly prolonged, seen the fetus perish from asphyxia without any other apparent reason.

Uterine inertia is more serious during the period of dilatation, if an abundant escape of liquor amnii, has (prematurely) taken place. At such times the body of the fetus as well as the placenta and umbilical cord are apt to be injuriously pressed upon, while the unequal distribution of blood in the uterus provokes an inflammatory condition. But happily, owing to the feebleness of the pains, even these results develop but slowly, and only when the delay is very great, does the condition grow dangerous.

§ 452. Inertia of the uterus is more injurious during the period of expulsion, for now even the uniformly distributed pressure, if it lasts beyond a certain time, and although only weak, is a source of danger. The risk to the mother arises from the fact that the same portions of the parturient canal are subjected to pressure for a long time, and may be rubbed through or slough; that to the fetus from the fact that the diminution of the placental area of attachment, which is not inconsiderable during this period, may easily lead to interference with its respiration. If moreover the increased pressure only acts at *special points*, delay will be all the more mischievous.

Uterine inertia is especially serious during the *last stage*, when the contractions ought to close the blood-vessels which have been opened by the detachment of the placenta; the danger of hæmorrhage is then very great.

It is obvious that the prognosis will be materially affected by the causes of the inertia, since some of them can be remedied, others not, and consequently sometimes a mild, sometimes a more energetic treatment will be necessary.

A weak or deficient abdominal pressure does but little harm, so long as the uterine contractions are good, although even then it can ill be dispensed with, if the obstruction is at all great. Such deficiency is of course more unfavourable, when associated with uterine inertia, especially where there is much obstruction at

the brim of the pelvis, or where the presenting part is at the pelvic outlet and on the perinæum, and when the trunk of the fœtus is retained after the delivery of the head.

Treatment.

§ 453. Uterine inertia can only be satisfactorily treated, when its cause has been clearly diagnosed, and the introductory observations show that it is not always easy to arrive at such diagnosis. Indeed I cannot too strongly advise the practitioner to be as sceptical and sparing of remedies as possible, and above all to seek to unravel the origin of each real or apparent abnormality of the expulsive forces. If this is done, it will generally be found that what appeared to be an anomaly *sui generis*, is in reality a necessary sequel to abnormal mechanical relations, and therefore requires no special treatment. Our guiding principle should invariably be to attack the cause of the anomaly, and for this purpose dietetic and pharmaceutical measures are almost always of more service than such as directly induce pains. Resort to the latter class or to operative interference is only allowable, where the influence of the uterine inertia on mother and fœtus leaves no alternative, and where it is from the first evident that the help which they can afford will effect the desired result.

§ 454. It is always well in the first place to notice the general condition of the lying-in woman and her surroundings. If the bladder and intestine are full, they should be emptied. If the direction of the axis of the uterus is abnormal in relation to the pelvic axis, it may be remedied by altering the position and posture of the woman, or, when necessary, the uterus may be fixed by an abdominal bandage. Where the contractions cause much suffering and the uterus is sensitive to pressure, a warm bath may be ordered, or warm fomentations to the abdomen, or morphia may be injected. Lastly, in those cases in which (from great nervousness and sensitiveness) the bearing down mechanism is thrown into action as soon as the slightest painful sensations are experienced, and thus exercises a prejudicial effect, opiates often work wonders; similarly too when the parturient woman is exhausted and wearied through want of sleep, through pain and excitement.

Imperfect development and structural anomalies of the uterus

cannot be got rid of during parturition, and artificial stimulation would only do harm; patience is here the great desideratum. During the second period of labour voluntary bearing down must be encouraged, and expression is of especial value. When the obstacle to efficient contractions arises from undue distention of the uterine wall, the evacuation of some liquor amnii will be the remedy. Uterine inertia due to a premature and excessive discharge of liquor amnii is the most difficult to treat; but it is a good plan to diminish the intra-uterine pressure as much as possible by forbidding the woman to bear down, by administering opiates, and, if necessary, by introducing an elastic bag into the cervix and lower uterine segment.

During the period of expulsion, the influence of delay on mother and fœtus must be constantly watched. So long as the condition of the former is good, and the parturient passages show no signs of inflammation (such as swelling, œdema, dryness of the mucous membranes, offensive discharge), and the fetal pulse remains unaltered, no vigorous measures are called for. The gentle means we possess of provoking pains (ergot, stimulants, rubbing the fundus uteri or expression), may often still suffice. If however an injurious influence shows itself in spite of those gentle measures, it will be necessary to extract the fœtus. Whether such extraction is allowable apart from this definite indication, *i.e.* merely in order to terminate a labour which is troublesome owing to its duration, will probably always be a matter of opinion. Private practice unquestionably often requires measures which the scientific judgment holds to be superfluous. But whatever decision the practitioner arrives at, he is never justified in doing injury!

§ 455. There are a great number of so-called "*oxytocic*" remedies. Some have a local action; others are internal, and act on the uterus through the blood. Only the most important and reliable amongst them will be referred to here.

Apart from the mechanical stimulation of the uterine muscle, which is produced by rubbing the *fundus and body* of the uterus through the abdominal walls, we may mention, amongst mild and (when properly carried out) safe remedies, *warm steam baths* and *very warm vaginal irrigations*. In taking the former, the woman sits with her vulva at the edge of the bed; a pan of steaming water (or chamomile tea) is then placed between her thighs,

and the whole of the lower part of her body well wrapped up, the steam vapour being allowed to exert its action for 5—10 minutes. In the case of *vaginal irrigations*, very warm, indeed hot¹ water, at a temperature of from 37—50° C. (100—120° F.) must be used, according to the sensitiveness of the individual; the douche may be given in the sitting or in the recumbent posture (with a draw-sheet). The glass tube should only have one large opening and be held parallel to the axis of the pelvic outlet, so that the stream may impinge directly upon the vaginal fundus and the lower segment of the uterus; but it should not be introduced very far into the vagina, lest the stream penetrate too directly into the uterus. These measures are especially to be recommended in simple uterine inertia, or where there is pain and inflammation.

Under some conditions, more particularly after premature rupture of the membranes, *plugging the vagina* (in this case with an india-rubber bag) is of great service; indeed owing to the counter-pressure which is thus exerted, it is also indicated where in spite of inefficient pains there is reason to fear a premature discharge of the liquor amnii. If the cervix dilates too slowly, if it offers a prolonged resistance, if the delay is caused by the escape of too much liquor amnii, the cervix and the lower segment of the uterus may be dilated by means of Tarnier's or Barnes' bags (*cf.* Induction of Premature Labour).

The introduction of an elastic catheter or bougie between the ovum and the uterine wall (*catheterisation of the uterus*) is one of the most powerful means of stimulating it. If however the conditions which accompany uterine inertia are borne in mind, such a step will rarely be found necessary, in spite of its numerous advocates². A further argument against this method is that it is associated in a high degree with the danger of premature and excessive irritation of the uterus, and especially with septic infection. I must therefore caution the practitioner against such a proceeding, especially after premature and copious discharge of liquor amnii. Indeed I only consider it as allowable where the rapid acceleration of labour is so urgently demanded as to justify the incurrence of those perils.

§ 456. The artificial rupture of the membranes is not infre-

¹ Runge is a strong advocate for very hot irrigations (*Archiv f. Gynäkologie*, xlii.

² *cf.* especially Valenta, *Die Catheterisatio uteri*, Vienna, 1871.

quently a powerful means of increasing the force of the pains and hastening delivery, and may be called for under various conditions. Thus (1) rupture may, as already stated, be a useful proceeding, where the uterine walls are unduly expanded, and it then sometimes greatly shortens the period of dilatation. (2) In cases where the musculature is lax, thin and but little developed (as it most often is in multiparis in whom several labours have followed rapidly on one another), the increased thickening of the uterine wall which follows on the partial evacuation and diminution of the uterine cavity, the altered arrangement of fibres in the wall, and the increased arching of the fundus after the evacuation, must increase the force of the pains. The rupture of the membranes may also be necessary (3) where the ovum does not advance under the influence of the general internal pressure, owing to the membranes being too firmly adherent to the walls of the uterus; and this may not only retard delivery when the os is fully dilated or nearly so, but also at a much earlier period, and annul the action of the pains. (4) A further indication exists where, owing to the unwillingness of the cervix to dilate under the influence of the pains, the pressure of the latter is not transmitted to the bag of membranes, so that the pressure in the fore-waters sinks below that to which the remaining uterine contents are exposed (*cf.* § 156). Under the last-mentioned circumstances the membranes may be ruptured with the finger or with a uterine sound &c., and this is best done during a contraction. But in the case of (1) and (2) the rupture must be performed during the interval between two pains, so as to prevent the liquor amnii from escaping too rapidly, the uterus from diminishing in size too suddenly, and the small parts of the fœtus from becoming prolapsed. Further it is a good plan to operate while the woman is on her side, and by means of external pressure to preserve the longitudinal lie of the fœtus, and to approximate the presenting part to the brim of the pelvis. Lastly, it is well to perforate the membranes at a point lying high above the os, so that some liquor amnii may, for a time at least, remain in the lower segment.

§ 457. Amongst the *internal* remedies that act as oxytocics, *secale cornutum* or *ergot* stands pre-eminent. Its power of strengthening pains is more certain than that of provoking them, although the latter cannot be altogether disproved. According

to Wernich, ergot acts by diminishing the venous "tone", and thus producing an increased fulness of the veins, in consequence of which the uterine arteries are partially emptied. The arterial anæmia which is produced in this way, then sets up irritation of the nervous centres situated in the uterus, and possibly also of those connected with this organ in the central nervous system. Hence when ergot is administered, the uterine contractions soon begin to grow stronger, the intermissions being shorter; until at last the latter are so short as almost to disappear, and the muscle is thrown into a condition of tetanus. Such a condition however has no expulsive effect, and moreover is very dangerous to the fœtus, owing to the gaseous interchange between it and the mother being interfered with; indeed even a state which falls short of tetanus, i.e. one in which the contractions follow rapidly upon one another, is liable to cause asphyxia of the fœtus. Hence it may be laid down as an axiom that *ergot must never be given as long as there are any mechanical obstacles to the progress of labour, therefore never during the period of dilatation, and during that of expulsion only when it is merely an insufficiency of expulsive force that prevents the termination of labour, when such termination can be confidently expected with good pains, and where there is nothing to prevent the extraction of the child, should necessity arise.* Moreover during the action of the ergot the fœtal heart must be constantly watched, in order that the child may be extracted as soon as signs of threatening asphyxia show themselves. It is in atonic conditions after delivery that this remedy is most valuable.

The active principle of ergot appears, according to Buchheim's investigations (*Archiv f. Exper. Path.*, iii., 1875, p. 1), to be produced by the action of the mycelium of a fungus that attacks rye, on the gluten of the latter. According to Wernich, Zweifel and Dragendorff, that principle is an acid, according to Nikitin sclerotinic acid¹. The great liability to change and decomposition of such substances explains why old preparations, as for example ergot that has been kept for some time in a damp and in a powdered condition, are uncertain in their action. Ergot must therefore always be ordered dry and freshly powdered, and it may then be administered as a powder in doses

¹ Nikitin's statements as regards the action of sclerotinic acid are not confirmed by Robert, Ganguillet, and Kennert.

of ca. grm. 1 (gr. xv) 2—3 times at intervals of 10—15 minutes, or as an infusion made with boiling water (grm. 5 : 100 of water = 1 drachm in 2½ oz. of water, 1 table-spoonful every 5 minutes). But the subcutaneous injection of ergotinum dialysatum is especially to be recommended (3 parts of ergotin to 15 of distilled water with 2 drops of a solution of bicarbonate of soda, so as to some extent to diminish the irritating secondary effect due to the acid that is present; a hypodermic syringe may be injected 3 times under the skin of the abdomen, 5 minutes being allowed to elapse between each injection). Ergotin may also be administered by the mouth: ergot. dialys. 2; tr. cinnamomi 40 parts; in doses of 1 tea-spoonful¹. The state of the bladder must be watched after the administration, since the secretion of urine is rendered very copious by ergot (Wernich).

§ 458. A number of remedies have lately been recommended as substitutes for ergot, especially cinnamon, borax, cannabis indica, digitalis, quinine, and quite lately pilocarpin.

Cinnamon was introduced by Van Swieten for post-partum hæmorrhage, and has become a popular remedy in atonic conditions of the uterus; it is at any rate a harmless one, and the tincture may therefore at any time be given as a stimulant.

Borax also has long had a reputation, although it is not so universally recommended; it used to be chiefly given in gastric disorders. We have no accurate observations as regards its influence on pains, and there are better remedies for gastric disorders.

Indian hemp (*cannabis indica*) was recommended by Christison and Simpson in doses² of about one tea-spoonful of the tincture, or grm. .25—.50 (gr. 4—8) of the extract, every quarter or half hour; it is probably merely a "nervine tonic".

Digitalis has proved useful for uterine hæmorrhage in the hands of Dickinson, Trousseau and Lasègue, and has therefore gained a reputation for exciting uterine contractions. The hæmostatic action of digitalis however is probably due to its influence on the heart and blood-vessels.

Quinine has been much used during the last few years³ for

¹ Tanret has obtained an alkaloid, *ergotinum crystallisatum*, which is said to be very efficient in doses of mgr. 4—6=gr. .06—.09 (cf. *Arch. Tocolog.*, 1877, p. 537).

² These doses are considerably larger than those usually given (Tr.).

³ Cf. Schmidt's *Jahrbuch*, vol. 159, p. 49; Smith, *Philadelphia Med. Times*, June, 1876; Easley, *Virginia Medical Monthly*, July, 1876; Lewis, *ibid.*, Feb., 1878.

increasing pains, and speaking generally a favourable influence on the regularity and force of contractions has been made out. This however appears to be due more to its general action than to any particular effect on the uterus; for quinine does not provoke pains in an organ that has hitherto been quiescent, as is shown by its (in this respect) entirely ineffectual use in pregnant women, especially in malarious districts.

Hydrochlorate of pilocarpin (injected subcutaneously in doses of grm. .02 = gr. $\frac{1}{2}$) has only been used for a short time as an oxytocic, but there is already a considerable literature on the subject¹. Its enthusiastic recommendation has soon been followed by sober statements, and now it is clear, as has been especially shown by the observations of my assistant Dr. Kroner (*Archiv f. Gym.*, xv., p. 92) and the confirmatory ones of P. Müller (*Verhandlungen der phys.-med. Gesellschaft zu Würzburg*, New Series, vol. xiv.), that the remedy is useless as an oxytocic, although it is quite possible that it may have a slight action in strengthening pains which are already present, an effect which is sometimes noticed.

Thus the favourable influence of all these and yet other remedies which have been recommended for weak pains, is only a secondary action, and no one of them can replace ergot, which is safe when properly used. As regards stimulating measures, such as electricity, irritation of the nipple, I will merely say that they are totally impracticable, if not worse.

§ 459. On the other hand *the method of expressing the fetus* deserves as much attention as has for some time been devoted to expression of the after-birth, although the former is of course of much more limited value. Expression accelerates delivery partly by mechanically irritating the uterus and thus inducing pains, partly, like the abdominal pressure, by adding a *vis a tergo* to the action of the contractions. The former effect however is much less important than the latter, first because such irritation can be obtained by gentler manipulations than those required by expression, secondly and mainly because in the cases in which expression is indicated, viz. where pains are insufficient, the uterine muscle is in a condition of but little irritability. Thus expression can only do that which under other circumstances a

¹ It may be found in *Centralblatt f. Gynäkologie*, 1878—80; and in *Schmidt's Jahrbuch*, vol. 178, p. 272, and vol. 181, p. 255.

powerful abdominal pressure would do, and can only be regarded as an adjunct to, or substitute for, the latter.

The combined pressure exerted by these two factors is far less than the force of the pains, and therefore a result can only be looked for from expression, where the resistance presented by the parturient canal and by the fœtus is very slight; this will be the case where the ora of the uterus are wide and non-resisting, where the vaginal walls are lax, where the pelvic floor is loose with a wide vulvar orifice, and where the lie of the fœtus is longitudinal and quite normal, and the attitude is also normal. Further it is desirable, indeed essential, that the walls of the uterus should not, while the pressure is being applied, be stretched at a different point to that which is being pressed, in other words that its volume be sufficiently small to allow the operator's hands to embrace it as completely as possible. Expression will therefore succeed better, the smaller the uterus, and consequently towards the end of labour, when the fœtal part is entering, or passing through, the vulva; especially after delivery of the head or after delivery of the lower end of the trunk in breech presentations; also in premature births.

Inasmuch as pains, by rendering the uterine wall tense, prevent its yielding while the pressure is being applied, expression will be most effectual if used during a contraction; at such a time it will really be a supplementary force.

If I add that the abdominal and uterine walls must be in a condition to allow the needful manipulations (*i.e.* they must not be over-sensitive and the former must be flaccid), all the requirements and indications for expressing the fœtus will have been given. Cases in which expression does much good before the birth of the presenting part will be rare, and scarcely ever will it prove a complete substitute for the pains; still more rarely prevent an otherwise necessary artificial extraction. The method will be most useful after partial delivery, and for assisting extraction.

§ 460. The *modus operandi* is very simple. The parturient woman lies on her back, the accoucheur sits by her side, and brings the uterus into the middle line and as far as possible parallel to the axis of the brim. He next presses the abdominal walls against the uterus, and grasps the fundus and its lateral edges with both hands at the same level in such a way that the

ulnar borders are directed to the posterior surface of the organ towards the pelvis, the thumbs lying on the anterior surface with their tips directed towards the middle line. If no pains are present, the abdominal walls should to begin with be gently rubbed against the uterus; an alternately increasing and decreasing pressure is next to be exerted for 5—8 seconds, and repeated at intervals of 1—5 minutes, as may be necessary. If the uterus is very small or if delivery is partly accomplished, one hand may often suffice; it should be placed on the fundus as is done when the placenta is to be expressed.

Lastly I may observe that the best way of regulating and increasing the action of the bearing down mechanism is often by encouraging, instructing, and firmly exhorting the woman.

b. "Too strong" Pains, precipitate Labour.

§ 461. Under the term "too strong" pains (*cf. supra*) we only include such as are so in relation to the obstacle they have to overcome. In most of such cases (the exceptions are few) the abnormality lies not in the pains, but in too small or too great an obstruction, a distinction which, as is obvious, is of more than theoretical interest.

The rare exceptions, which have just been referred to, are presented in the first place by the cases in which, *although the obstruction is normal*, the pains are unusually strong and persistent. In such a condition it is not so much the force exerted by each individual pain which is injurious, as the rapid succession of "pains" and the almost complete absence of intervals. The results are more serious for the fœtus than for the mother. The latter may be greatly excited by the incessant contractions, by the constant bearing down and forcing, by the absence of any period of rest; indeed after delivery a condition approaching collapse may momentarily show itself, or the vagina and perinæum may be injured, in consequence of the dilatation being too rapid and of the parts not being properly prepared. The fœtus on the other hand runs extreme danger owing to the prolonged compression to which it is subjected, and to the prolonged interference with the interchange of gases which occurs during the pains; its cranial bones too may be fractured, since they have not sufficient time for mutual displacement and flattening. It is only under

quite exceptional conditions that the child will be precipitated on the floor, since the agonised woman almost always keeps to her bed.

Such precipitate uterine activity, when not dependent on the resistance, is due to an excessive irritation of the uterus either by internal remedies or by some local cause, the latter of which includes the premature rupture of the membranes. Treatment consists in enjoining the lateral posture with strong anterior flexion of the upper half of the body, in which posture bearing down has the least effect (it is useless merely to forbid the latter, where the forcing is severe), in withdrawing all means of fixing the extremities, and in the use of narcotics, e.g. morphia injected subcutaneously in large doses, the administration of chloroform, chloral enemata (grm. 3—5 = gr. xlv—lxxv).. In vigorous persons bleeding to the extent of grm. 200—300 (6 or 9 oz.) is sometimes of great service. The perineum must be carefully watched and supported.

§ 462. "The strongest pains are frequently seen in cases where the *obstruction is abnormally great*, and under such circumstances generally in women whose uterus has not been exhausted by numerous antecedent labours. Such pains are in proportion to the resistance, and this is of course as a general rule just what is wanted for overcoming the latter. If however the obstruction is not overcome by the pains within a certain period of time, the excessive uterine activity is followed by injurious consequences both for mother and fetus. For further particulars I must refer to the sections dealing with this matter, especially to the chapter on "Contracted Pelvis."

§ 463. Cases are commoner in which the pains, although not in reality too strong, yet appear to be so owing to an *abnormally slight obstruction*, whether the latter is due to a very small fetus, to too wide a pelvis or to too open a pelvic floor. Labour may then take place uncommonly rapidly, indeed the passage of the vagina and perineum may be completed in a few minutes. This however scarcely ever does any harm, the worst result being that the unduly rapid evacuation of the uterus might interfere with its retraction, and be followed by a condition of atony. If further injurious consequences are to follow upon the slight resistance, additional factors must be superadded: and such are an abnormally strong abdominal pressure, and delivery

in the erect posture, or in one with a similar effect as the latter (squatting, sitting), in which the weight of the child may possibly be superadded to the expulsive force. In such a case a *hurried* or *precipitate labour* may result, and the child be forced out of the parturient-canal and fall on the floor.

Rupture of the perinæum, an atonic condition of the uterus *post partum*, prolapse and inversion of the same are the possible *dangers to the mother* which accompany *precipitate labour*; moreover the rapid emptying of the uterus may lead to a sudden overfilling of the abdominal blood-vessels, and thus to anæmia of the brain and heart and to deep unconsciousness. But it is noticeable that all these sequelæ are extremely rare; I have only seen two or three of them three or four times after a precipitate labour.

The *child* is exposed to the danger of rupturing its umbilical cord and of falling on the floor. The former risk is mainly due to the weight of the child, to the height of the fall, and to some peculiarity of the cord (cf. § 762). In rare cases the rupture takes place near the insertion into the navel, but generally at some distance from it; consequently the hæmorrhage, if any, is usually slight. The torn ends are always very irregular, the sheath of the umbilical cord generally forms a jagged prolongation of the stump from which the vessels, which have been torn through at unequal levels, project. The head of the child may be damaged by the fall; but apart from contusion and abrasion of the coverings of the skull, injuries and especially fractures of bones are very rare; the elasticity of the latter, the usually slight distance of the fall when the woman is sitting or squatting, the fact that the force of the fall is broken by the resistance of the cord, and that the head is rarely the part that strikes the ground first, explain this. Doubtless the perils accompanying such a fall during delivery are often greatly exaggerated.

Where there is reason to fear a precipitate labour, the parturient woman should be kept constantly in bed lying on her side. The bearing down efforts and the pains should be moderated by narcotics, and the progress of the child and the perinæum kept under observation from an early period.

§ 464. *An unduly strong abdominal pressure* is on the whole commoner than too feeble a pressure, and is also more injurious. It occurs not only where the obstruction is abnormally great or

normal, but also where it is too slight; it may, or may not, be associated with a similar activity of the uterus, and is seen both in the period of dilatation and in that of expulsion. During the first period, and in the second also where there is great resistance, it is usually set going instinctively, but under other circumstances it is largely under the control of the will.

We have already spoken of the weakening influence which too early a use of the abdominal pressure has on the pains. But even when the cervix is dilated, very violent straining involves great risk of the cervix being lacerated, as when the presenting part of the fœtus is unable, owing to some mechanical disproportion, to advance into, and through, the pelvic inlet, and therefore is incessantly driven against the stretched cervix, or when it perforates some portion by rubbing it against prominent points of the pelvis; with such a disproportion moreover the abdominal pressure may also to some extent prevent the head from becoming adapted to the form of the pelvis, inasmuch as it fixes the former too firmly at particular points of the latter. The force of the abdominal pressure may be enormous in such cases; every muscle is called into requisition, the face is cyanotic, the eyes are injected, the veins of the neck distended, the respiratory acts are separated by long pauses, the pulse is intermittent. The woman continues to bear down more or less even during the intervals between the pains, since the forcing sensation is an overpowering one, although of course such untimely straining during the intermission is injurious to the mechanism of labour.

The degree of force that can be developed is shown by the cases in which the sternum¹ has been fractured, and emphysema of the neck, face and thorax caused by bursting of the pulmonary air-vesicles². I need hardly add that women suffering from

¹ Cf. *Revue Méd.*, Nov. 1827; *Gazette Méd. de Paris*, No. 23, 1858; Borland, *Boston Medical and Surgical Journal*, April 29, 1875; and the cases of Lucchetti and Posta by Corradi, in *Schmidt's Jahrbuch*, vol. 175, p. 213.

² Cf. the cases of Soyre in *Gazette des Hôpitaux*, 1864, No. 92—100; Mackenzie, *American Journal of Obstetrics*, iv., p. 203; Atthill, *Obst. J. Great Britain*, April, 1876, p. 18; Law, *ibid.*, Oct., 1877, p. 477; Alereeff, *Archiv f. Gyn.*, ix., p. 437; Worthington, *British Med. J.*, Jan. 29, 1876; Nelson, *Edinburgh Med. J.*, July, 1877, p. 43; Prince, *Lancet*, 1876, i., No. 3; Fischer, *Zeitschrift f. Wundärzte und Geburtshülfe*, vol. 28, Part 2; the thesis by Haultœur, in *Gazette Obstetr.*, No. 16, 1874; Sinclair and Johnston in their *Practical Midwifery*, 1856, p. 517, record 7 cases amongst 13,748 births. The occurrence has no great importance for the woman concerned.

pulmonary or cardiac disease will be especially endangered by such severe muscular work.

Where there is but a slight resistance, an unduly strong abdominal pressure may even without good pains lead to rapid and precipitate delivery, especially when the posture of the parturient woman (*cf. supra*) favours this. If the cervix is still insufficiently dilated, the uterus with its contents may be driven down upon the perinæum and even out of the pelvic outlet.

The best treatment for cases of untimely or unduly strong bearing down is, apart from any measures suggested by a consideration of the causal influences, that given in §§ 461 and 463.

c. Spasmodic Pains.

In daily practice we frequently hear unduly irritating, painful and but little effectual contractions spoken of as spasmodic pains, although they do not really deserve the name (*cf. "too feeble" pains* § 449). There are two kinds of true spasmodic pains, (1) such as lead to persistent general contraction, and (2) such as cause spasmodic stricture of the uterus.

§ 465. (1) A state of persistent contraction (*general tonic spasm of the uterus*, called *tetanus* in its severest forms) is extremely rare, and must be looked upon as an exacerbation of the unduly strong pains already mentioned in §§ 461 and 462. It is characterised by the total absence of relaxation of the uterine muscle, although a more or less regular decrease of the highest degree of contraction occasionally shows itself. Such a condition has no, or at least no material, influence on the progress of labour, and is caused by too great an obstruction, by over-irritation, by injudicious manipulations or by internal remedies. The condition is an extremely painful one, both subjectively and objectively; it soon leads, especially after escape of the liquor amnii, to an inflamed state of the uterine wall, and is apt to be followed by laceration of the stretched cervix, particularly if the obstruction prevents the entrance of the fetus into the pelvis; further it threatens the fetus with asphyxia, and pressure on its brain, owing to the compression and interference with the exchange of gases which it produces. The best remedies are narcotics in large doses; sometimes also warm baths, nauseants, (ipecacuanha, antimonium tartrate in divided doses) or venesection.

tion act rapidly. It is very important that the uterus shall be thoroughly relaxed before any of the operations demanded by such a spasmodic condition are undertaken; any interference with the uterus while in its irritable state, would be followed by serious consequences.

§ 466. There is another condition, somewhat different from this persistent (or nearly persistent) contraction of the uterus, namely the *close application of the uterine wall to the body of the fœtus*, as is most often observed where the presentation is abnormal, and after too copious a discharge of liquor amnii.

In cases of *transverse presentation* the entire force of the pains acts on the tense bag of membranes which is lying above the os uteri, owing to the fact that in these cases the fore-waters are not at any time cut off from the remainder of the liquor amnii. Consequently when the membranes rupture, a large quantity of amniotic fluid is discharged, all the more so since the shoulder which descends with the escape of the fluid, is rarely adapted evenly and all round to the lower segment of the uterus, and thus is unable to shut off the remainder of the liquor amnii. With every fresh pressure on the uterine wall therefore more amniotic fluid is discharged, and such pressure is exerted, whenever the woman bears down. At the various points where the uterine walls are internally bathed by liquor amnii (the latter can, as soon as the pressure is applied, at once escape through the os), this pressure, which is transmitted through the intestines, rapidly forces these portions of the walls against the body of the fœtus. Consequently it quickly produces a condition, in which the uterus is closely applied to the fœtus, and here and there converts what should be externally a convex wall into a concave one. The uterus now continues to embrace the fœtus in this way, and gives rise to the condition which is generally designated by the term *tetanic constriction of the fœtus*. As a matter of fact however such is not the true condition, for the presenting part of the child is not firmly impacted in the pelvic brim, the uterus is not sensitive to pressure, nor does the hand on being introduced, meet with any very great resistance.

Before long, intermittent contractions set in, which tend to diminish the parietal surface of the uterus, and thereby cause the indented portions to become flatter. These contractions therefore must tend to straighten the concave surface of the fœtus,

while pressing on the convex ; the ends of the fœtus are approximated, and since the changes produced in this way by the pains are never again entirely lost during the intervals between them, the tension to which the body of the fœtus is exposed, leads to a permanent tension of the uterine wall. Thus then the uterus appears to remain continuously contracted. The very different action of the uterine wall on different parts of the fœtus leads to an irregular distribution of blood in it, while in the tense uterine wall signs of inflammation gradually set in, which may lead to a paralysed or even rigid condition (*Erstarrung*) of the muscle. In this condition any operation within the uterine cavity is extremely difficult and dangerous, and the case is a typical one of the so-called *spasmodic inflammatory constriction* (Nægele).

It will be obvious that when the uterus is in immediate and intimate contact with the fœtus, *the abnormal presentation must be rectified as quickly as possible and the fœtus itself extracted* ; the operating hand here actually assists the efforts of the uterus to retract, by overcoming the concavity which has formed in the several portions of its walls. If however the sequelæ just mentioned have become well marked, narcotics ought first of all be allowed to exert their influence, and in case of necessity, if they do not remedy the condition, the fœtus must be removed without the introduction of the hand into the uterine cavity (for more information *cf.* §§ 644—6).

§ 467. (2) The *localised tonic spasm or spasmodic stricture* only affects those bundles of fibres which are arranged in sphincterlike fashion, and is therefore confined to the external and internal ora.

Stricture of the *external os* only occurs during the period of dilatation and indeed in its first stages, especially in first labours ; the few cases (3) which I have seen, were all in primiparæ. The edges of the os remain persistently stretched and hard, sometimes quite rigid ; the tension may diminish from time to time, but never relaxes entirely ; the surrounding tissues are lax. During a uterine contraction there is no sign of any dilatation of the orifice, but rather an apparent diminution, and the presenting part *recedes* upwards. Severe pain is present both on contact with the os and apart from such contact ; it is mainly felt in the sacrum and thighs, although the neighbouring organs are also affected, *e.g.* the bladder, and the bowels with

colic, tenesmus and nausea. If the uterine muscle is meanwhile acting well, the cervical portion, and especially its anterior wall, may be driven low down by the fœtus, while the os moves backwards and upwards; indeed it is said that the edges of the os may be deeply lacerated.

This form of stricture may develop both with an intact bag of membranes, and after premature discharge of the liquor amnii. Its causes are either rough manipulations made with a view of diagnosis or in order to dilate the orifice which is enlarging only slowly, or metritic conditions, and on this account the prognosis for the post-partum state is not free from anxiety. *Treatment* (apart from that required by the general condition) consists in the use of warmth (baths, warm fomentations to the abdomen, warm vaginal irrigations), derivatives (mustard poultices, turpentine fomentations to the hypogastrium), and in the free administration of narcotics. If in spite of these measures the stricture remains obstinate and threatens to endanger mother and child, the edge of the os should be incised under antiseptic precautions, and this must be done deeply enough to be really of use; it is better to make one or two relatively deep cuts than numerous superficial ones (*cf.* also Poppel, *Monatsschrift f. Geburtskunde*, xxi., p. 321). The little operation is best carried out with a pair of long fistula scissors with blunt points; the probe-pointed bistoury is very apt to injure any vaginal folds which come into contact with it.

§ 468. *Strictures of the internal os* are commoner than those of the external. During the *period of dilatation* I have only seen them with premature labours after premature rupture of the membranes; in births at the full term only with presentations of the breech, the latter being swollen and tense in consequence, and twice with transverse presentations where the amniotic fluid was discharged prematurely. The stricture is commonest during the *period of expulsion*, and either grips the shoulders or the thorax after descent of the head into, or out of, the vagina, or else the neck after delivery of the body in pelvic presentations. The cordlike constriction can in such a case sometimes be felt through the abdominal walls. All progress of the fœtus then comes to an end; what appears to be progress is merely due to the abdominal pressure, and when the latter ceases, the presenting part which had advanced, returns to its

previous position. This condition, like spasm of the external os, is very painful, and accompanied by the same sympathetic sensations in the neighbouring organs, and by the same general excitement. For the foetus it is extremely serious, owing to the delay in delivery (as little delay must be allowed as possible), and to the asphyxia which so readily supervenes. The diagnosis is easy when the body is delivered, but may be very difficult in head presentations, when the constricted points cannot be reached by the finger. It must then be based on the interference with the progress of the head which has been mentioned, and on the other symptoms. Stricture during the *after-birth period* is the most familiar, both with retention of the placenta and after its expulsion (*cf. sub* "Hæmorrhage" § 697).

The *causes* are the discharge of liquor amnii at the commencement, or before the onset, of parturient activity; in pelvic and transverse presentations, premature traction on the presenting parts; over-irritation of the muscle generally, the inappropriate use of ergot, chilling of the lower half of the body, and metritis. The same causes continue to act during the after-birth period; but as an additional and special cause of irritation to the sphincter we have here the traction on the umbilical cord before the placenta is quite separated, or where it is for some other reason retained in the uterine cavity.

The *treatment* is the same as that which has been given in the previous paragraph *et ante* (*cf.* §§ 461 and 463).

In addition to the narcotics that have been already enumerated, Fränkel has recommended for all stages of labour the combined subcutaneous injection of hydrochlorate of morphia and sulphate of atropine (the latter of which has already by itself been recommended by Fresenius, 1866), followed by the administration of chloroform; anaesthesia is said to be more easily induced, and less dangerous after such injection. The antagonism of morphia and atropine which some observers have asserted, does not exist in the case of the uterus, according to Fränkel and others. The dose of atropine however must not exceed mgr. 1=gr. '015'; that of morphia varies from grm. '015—'03=ca. gr. $\frac{1}{4}$ — $\frac{1}{2}$.

No operative measures must be undertaken, as long as the stricture lasts. Artificial dilatation is scarcely ever required, and must only be resorted to where absolutely necessary, and even then with great caution. Incisions are entirely forbidden owing to the great danger of the subsequent development of severe puerperal disease.

¹ In regard to atropine, *cf.* Horton, *Amer. J. Obstet.*, 1874, p. 432.

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2. Deformities of the Pelvis.

§ 469. Every pelvis which deviates in any of its relations or in any respect from the condition described in PART I. of this Text Book is abnormal. But the accoucheur merely looks upon the pelvis as the firm substratum of the parturient canal, and is only interested in abnormalities in so far as they affect the passage of the foetus through that canal. The genesis of the various forms may be important as throwing light on the kind and degree of anomaly; still from his point of view all varieties may be classed either as *too wide* or *too narrow* pelvises.

§ 470. The *unduly wide pelvis* is not always met with in persons of large and very bony build, but also in delicately made and graceful individuals, although it is almost always associated with a marked development as regards width. Width of the sacrum and of the pubic arch are therefore almost constantly present, while the other diameters are only slightly, if at all, elongated. It is rare for all the diameters to be equally increased, still rarer for the direct diameter to be so most. The increase

is as a rule unimportant, and rarely exceeds 2 cm. (.75 inch). The enlargement may either affect the whole pelvic canal (*pelvis aequabiliter justo major*), or else it ceases below, and the outlet is of ordinary dimensions (*pelvis infundibuliformis justo major*). Enlargement of the outlet alone is always an accompaniment of a contracted brim, and therefore does not belong to this section.

Abnormal width*disposes to precipitate labour, owing to the want of sufficient obstruction, and does so all the more readily, inasmuch as it is frequently associated with too slight a pelvic inclination; but in order that the labour may really be precipitate, other factors must be superadded, of which I have spoken above (§ 463). The diminished resistance may also explain the absence of the foetal rotations which are due to the pelvis, *i.e.* the absence of a true mechanism; it may further during pregnancy cause the head to advance too early or too deeply into the pelvic cavity. But all these are results of such secondary rank, that we can hardly assign to the unduly wide pelvis any special pathological importance.

§ 471. Pelves that are *inclined to an abnormal degree* have also been grouped amongst the abnormal, and rightly so, for they may lead to some irregularities. Excessive inclination may hinder the head from engaging in the brim, while on the other hand insufficient inclination may cause the head to descend upon the pelvic floor with too much force, may interfere with its exit, and endanger the perineum. All these sequelae however can be counter-acted if the parturient woman assumes a judicious posture. Where the inclination is too great, the half-sitting posture is the best, *viz.* that in which the buttocks and the upper part of the body are high, the lumbar region low; where the inclination is too slight, the latter should be raised and the pelvis placed relatively low (*cf.* § 193).

§ 472. It is however only *contraction of the pelvis* that is of paramount importance; indeed so true is this that all other anomalies which might interfere with the progress of labour, sink into the background, when compared with it. I do not exaggerate, when I say that the study of pelvic contractions is at the present time the most important in, and constitutes a large part of, the science of midwifery. It is however mainly during the last generation that we have arrived at a due appreciation of this

importance, and the credit rests almost entirely with German obstetricians¹.

Contracted Pelves.

1. Subdivisions, Definition and Frequency.

§ 473. Contracted pelves present very great differences both as to the extent to which the cavity is encroached upon, and especially as to the kind of contraction. According to their shape they may be divided into such as possess the usual dimensions of the female pelvis but on a reduced scale, and therefore are only abnormal in virtue of having a small capacity (*pelvis aequabiliter justo minor*), and into such as deviate from the regular form, either owing to curvatures of the bones, to alterations in their relative size, or to mutual displacement &c. In this second group, which includes the largest number of contracted pelves, the normal relation of the several diameters to each other is disturbed, and these pelves must therefore be either contracted antero-posteriorly (*flat pelvis*), or obliquely, or transversely, or lastly the various parts may be squeezed² in towards one another (*Litzmann*). To this group must be added those pelves that are altered in consequence of dislocation of the femora, as well as those which are obstructed owing to dislocation of the spinal column or to exostoses.

Amongst these very distinct varieties, there are however three which possess pre-eminent importance. This is partly because they are very frequent in comparison to the others, partly because the narrowing (in these 3 varieties) mainly affects the pelvic brim, is, usually not very great, and (as a consequence of this) interferes with labour not merely by obstructing the pelvic canal, but by the primary mechanical result leading to the most diverse irregularities in the condition of the uterus, of the pains and the fœtus (*cf. §§ 502 et seq.*). These pelves are the ordinary flat, or antero-posteriorly contracted, pelvis, the generally contracted pelvis, and the combination of the two, viz. the generally contracted flat pelvis. These three forms demand special con-

¹ English and French obstetricians have even now hardly appreciated the full importance of this subject, as a glance at their most popular text books (*Ramsbotham, Leishman, Playfair, Cazneau, Joulin*) proves. The "*Revue Générale*," by Dupuy, in *Annales de Gynécologie*, li., 1874, p. 212, shows this well.

² *Zusammengedrückt*.

sideration, and it is therefore of practical importance to distinguish them from the other much rarer kinds, and to discuss the two divisions separately.

§ 474. *At what point does pelvic contraction begin?* This question only concerns the ordinary forms just referred to; the rarer ones are almost always so greatly contracted that the difficulty does not arise. With the former however the question is far from superfluous, for if we were to regard as contracted every pelvis of which one or other diameter measures less than the average length given above, we should go too far, since slight contractions, even when the fetal head has the average dimensions (and it is only such heads that we need consider here), frequently cause no disturbance whatever. If on the other hand only such pelves are spoken of as contracted in which merely the mechanical progress of labour, the transit through the pelvic canal is hindered and rendered abnormally difficult, if therefore contraction and difficult labour are regarded as convertible terms, we should sadly neglect the influence of contraction on the other factors of labour, overlook the causes of many disorders, and indeed return to an aspect of things, which has long been an obstacle to the development of scientific midwifery.

We may therefore define the limit at which "obstetrical contraction" begins as that measurement of the sagittal diameter of the brim¹, at which according to our present experience, if not necessarily the immediate obstruction, still the indirect mechanical and therefore disturbing effects, and the more remote sequelæ with which contraction is associated, show, or at any rate may show, themselves; Michaelis was the first to call attention to the latter, and has done so in a truly classical manner. Of course a gravid woman may be easily and successfully delivered with a pelvis as above defined (although subsequent labours are usually rendered dangerous by the contraction); still we are bound to rank it amongst contracted pelves, not only because labour may at any time be rendered difficult, but because it is just such a pelvis that most distinctly shows the more remote influences of contraction on the mechanism of labour.

From this point of view contraction begins with a conjugata

¹ I have already mentioned that all the forms of pelvis we are now discussing, present the narrowing at the brim, and always in the conjugata vern.

vera of 10 cm.¹ (4 inches). Most authors only admit this upper limit for generally contracted pelves, and in the case of flat pelves set it at 9.5 cm. (3.75 in.); but my experience does not justify such a course, for I have frequently in a flat pelvis, with a conjugata vera of from 9.5—10 cm., been able to make out the effect of the contraction on the position of the head, presentation &c. That such an influence may be absent where the head is unusually small, is of course as easy to understand as the fact that an unduly large head may even with a normal pelvis give rise to the symptoms of pelvic contraction.

§ 475. As long as only the higher degrees of contraction were taken into account, i.e. those which lead to mechanical difficulties during labour, obstetricians supposed that the frequency of pelvic contraction varied greatly with geographical conditions. But from the point of view above described it is found that where the relations of the pelvis are systematically investigated, the frequency is everywhere almost the same. Michaelis and Litzmann found the average frequency to lie between 13 and 15 per cent., Schwartz (*Monatsschrift f. Geb.*, xxvii., p. 437) between 20 and 22 per cent., Muller (*Archiv f. Gyn.*, xvi., p. 155) estimates that it amounts to 16 per cent., Schröder to 14.6 per cent., I myself to about 14 per cent., so that about one in every seven pelves must be regarded as contracted. That this however must be looked upon as the extreme frequency will be clear, if the conformation of body and the social position of the women who are admitted into lying-in hospitals, are borne in mind.

2. The Diagnosis of Contracted Pelves—Pelvimetry.

§ 476. In settling this problem, we have not only to arrive at a diagnosis whether a pelvis is contracted or not, but also to determine the degree and kind of contraction, and the general character of the pelvis. This object is attained partly by considering all the present and past conditions of the person concerned, partly by directly exploring the pelvis, the peculiarities of every variety being of course borne in mind. It is unquestionably the actual examination, i.e. the measurement of the pelvis, that yields the most important and in reality the only decisive results. Still the other circumstances deserve that full weight

be given them, and even if they never afford more than certain *points d'appui*, suggestive to a certain extent of the direction in which measurements should especially be made, they nevertheless assist in deciding the best treatment for special cases.

§ 477. In enquiring into the *past history* of a woman, those points should be especially noted which make it probable or certain that she suffered in her childhood, or subsequently, from *disease of the bones*, particularly from affections of the lower limbs. Too great weight however must not be laid either on positive or on negative statements, especially since rickets does not always leave pelvic deformity behind it, and it still more often happens that the pelvic deformity which is undoubtedly usually present, is not always in proportion as regards intensity to the traces of the disease which are present in other parts of the skeleton. Moreover a rickety pelvis is sometimes met with in which not only all information as regards disease in childhood, but also in which all the other ordinary rachitic symptoms are absent. The same is true of other diseases of the bones and joints. Michaelis asserts that pelvic contraction may be *inherited*; I have no data of my own to give on the subject, but the mere fact of rickety mothers having rickety children is no proof of heredity. Enquiry must of course be made as to the *course of previous deliveries*, and all the more stress should be laid upon such, if at all difficult, or if terminated artificially. On the other hand we must not be too much influenced by the statements of the patient; for it is just as common to meet with pelvic deformity in individuals who have been delivered spontaneously and successfully (and this is true especially of the first labour), as in those that have had difficult and instrumental labours. And here again it must not be forgotten that pelvic contraction shows itself just as often in some disturbance of the presentation and position of the fœtus and of the pains, as in a purely mechanical difficulty, and that these conditions may of course vary greatly in different labours.

§ 478. More importance attaches to the *general build*, to the *conformation and proportions of the bony frame-work of the woman*, although her general physical development will only justify conclusions as regards the pelvis, when the case is an extreme one. Still abnormal width or narrowness of the hips, abnormal conformation, direction or shortness of the lower

extremities, or anomalous curvature of the spinal column should certainly arouse suspicion. Unusual shortness of the limbs points to an impeded general development of the pelvis (rickets); curvatures of the former to similar changes in the latter; unequal length of the legs and an unequal relation to the hip-joints show that the pressure relations to which the pelvis is exposed, are abnormal and unequal on the two sides. The same observation is true of deviations of the vertebral column; for when such are present, the pelvis is rarely normal, and conversely it is rare for the vertebral column to be entirely unaffected, when the pelvis is abnormal. The curvature of the vertebral column may be primary and the pelvic deformity secondary, or *vice versa*; and in this connection it is especially deviations in the lumbar and sacral regions that are significant. In any case it is important carefully to note the time when these anomalies originated, since those that develop during the growth of the bones, exert a very different influence to those that have originated in later years, where such an influence is usually entirely absent.

§ 479. It is however only the *examination of the pelvis itself* which yields conclusive evidence of pelvic contraction, and it is a good plan, indeed I cannot too strongly recommend the practitioner, always to explore the pelvis, whenever he examines a pregnant or parturient woman, even when he has not the slightest reason to suspect contraction. If this is done, not only will no anomaly be overlooked, but he will gain an experience of pelvimetry (and it is always difficult to the inexperienced) which will save him from finding himself suddenly surrounded by difficulties in the middle of a labour, difficulties of which he had no previous suspicion, and which he might possibly have been able to prevent or at any rate to mitigate, had they been recognised in time.

The woman who is about to be examined, must be placed flat on her back, and it is very desirable that she lie perfectly straight, and keep in the same position while the measurements are being taken. If however the direction of the pelvis is asymmetrical and abnormal, it may be useful to look at and palpate the woman while erect, before she lies down on her back.

The examination itself is divided into the external and internal.

(1) *External Measurement.*

§ 480. This must begin with the manual examination, during which attention is directed to the development (in size) of the pelvic bones, to the relative position of the *ossa innominata*; to the elevation, inclination, convexity and divergence of the *iliac ale*; to the connection of the *sacrum* with the lumbar vertebrae and its position between the hip bones, as well as to its length, width and curvature. The mode of union of the *coccyx*, as well as the angle which it forms with the sacrum; the strength, height and inclination of the *symphysis* must also be noted. This examination is next followed by the accurate determination of the distance between certain points, which points must be such as can be readily found, and possess edges which are not covered by too thick a layer of soft parts, and at the same time make it possible to draw reliable inferences as to the relations of the small pelvis. These requirements are only satisfied by the two transverse diameters of the great pelvis, *dist. Sp. I.* and *Cr. I.*, and by the *conjugata externa*.

The measurements are made with the help of a pair of *callipers*, either the well known instrument of Baudelocque, which has two curved limbs and a scale between them; or better with the instrument of B. Schultze (fig. 76) which can be folded, or that of Matthieu (fig. 77) which has the advantage of being adjustable without screws.

§ 481. The *dist. Sp. I.* and *Cr. I.* should be measured first. For this purpose the practitioner stands at the side of the woman (looking towards her feet), and takes the limbs of the instrument one in each hand between his thumb and fingers, in such a way as to leave the tips of the latter free; he then seeks for the points whose distance from one another is to be measured. Obstetricians have agreed to accept for the *distantia spinarum* the points lying immediately external to the attachment of the tendon of the *sartorius*, and for the *distantia cristarum* those points on the external lips of the crests, where the latter are farthest apart; the *dist. Sp. I.* measured in this way amounts in the normal pelvis on an average to 26 cm. (10·25 in.), while the *dist. Cr. I.* amounts to 28·5—29 cm. (11·25—11·5 in.). The terminal points of the iliac spines can readily be made out with the free finger tips, and the distance obtained is then read off:

the fingers, still guiding the points of the callipers, are next rapidly slipped back along the outer edges of the crests, until after one or two attempts and comparisons the points of greatest divergence have been discovered.

The results thus obtained may be as follows:—

(a.) *The measurements may be average ones, and bear the usual relation to one another (Cr. I. 2·5—3 cm. [1—1·25 in.] longer than Sp. I.).*

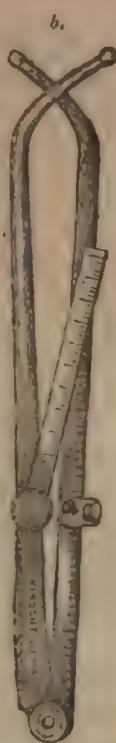
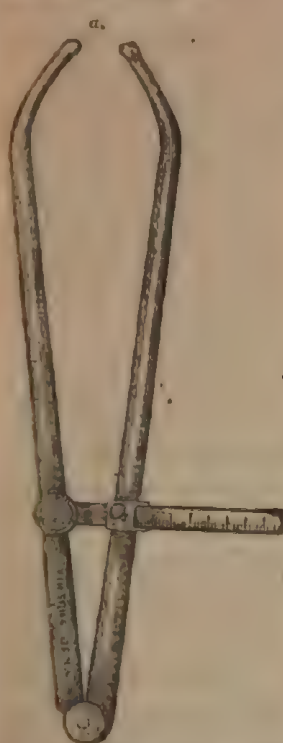


Fig. 76.—Schultz's Callipers. ($\frac{1}{2}$ nat. size.)
a. Open. b. Folded.

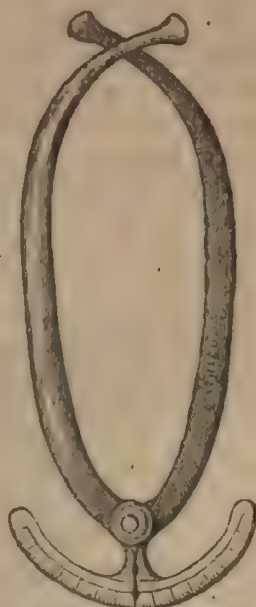


Fig. 77.—Matthieu's Callipers.
($\frac{1}{2}$ nat. size.)

(b.) *The measurements may be more or less below the average, but bear the normal relation to one another.*

(c.) *The measurement of Cr. I. may be an average one, while that of Sp. I. is above the average; the difference between them may be slight, or have disappeared, or their relation may be reversed.*

(d.) Both measurements may be below the average, but at the same time bear the relation given under (c).

In case *a.* we have almost certainly to do with a pelvis of normal size: in case *b.* with one whose original development left it too small, but which is in other respects of the usual shape (generally contracted pelvis). In case *c.* the pelvis will be transversely expanded, *i.e.* flat, with otherwise normal relations; in case *d.* it will be small and at the same time flat (generally contracted, flat pelvis).

The measurements of *dist. Sp.* and *Cr. I.* therefore only give us decisive information as to whether we have to do with a contracted pelvis, and then as to the variety of such, but scarcely help us at all as regards the degree of the contraction, although it is safe to conclude, where the relation of the two measurements is markedly disturbed, that the conjugate is considerably shortened. Some observers indeed have thought it possible that the measurement of the external transverse diameter would give us information as to the length of the transverse diameter of the pelvic brim (*cf.* Scheffer, *Monatsschrift für Geb.*, xxxi., p. 299); but this is only true in a very general way, large external measurements generally coinciding with similar internal ones and *vice versa*. No definite conclusion can be based upon such evidence, for the reason that we are unable accurately to determine the thickness of the bones and their coverings, the height of the iliac alæ and their inclination to the horizon, elements which of course will greatly affect the relation in question.

§ 482. The *external conjugate* is measured while the woman lies on her side, the practitioner standing behind her. The *posterior terminal point* (*viz.* the depression below the spinous process of the last lumbar vertebra) is easily found, provided the coverings are not too thick and tense; under other conditions he will rarely go wrong in seeking for it 3—4 cm. (1.25—1.5 in.) below the level of the iliac crests, or 1 cm. (ca. .5 in.) above the line which connects the two usually very distinct pits produced by the posterior superior spines (*Credé*); for the *anterior terminal point*, that part of the symphysis is selected, which yields the greatest measurement. This conjugate averages 20 cm. (7.75 in.).

There is no definite relation between *C. e.* and *C. v.*, and it is not possible by deducting a fixed quantity from the former to

obtain the latter; with a C. v. of 8 cm. (3.1 in.), I have found the C. e. to vary between 19 and 15 cm. (ca. 7.5 and 6 in.), with a C. v. of 7.5 cm. (2.9 in.) from 20—15 cm. (7.75—6 in.). Nor is it difficult to account for this difference, when we remember the varying thickness of the bones and soft parts, and the very different direction which the lines of the two measurements have relative to each other. All that we can say therefore is that a shortening of the C. e. justifies us in expecting a similar shortening of the C. v., and that if the shortening of the former is considerable, *i.e.* has reached to below 16 cm. (6.25 in.), it makes the shortening of the latter certain. By how much it does so however is uncertain, nor does the uncertainty matter much, since the measurement of the C. diagonalis is a better means of finding it. The slight value of the C. e. is somewhat enhanced by comparing it with dist. Sp. and Cr. L., inasmuch as such comparison enables us fairly accurately to decide what the shape of the pelvis is.

§ 483. In addition to these three measurements, there are others that have been regarded as important by various authors, but experience has shown that none of them satisfy the conditions which are mentioned above in regard to external measurements (§ 480).

The distance between the trochanters (Tr.) varies both in normal and contracted pelves within the same limits; it is therefore, except in extreme cases, quite useless either for diagnosing contraction in general, or its degree in particular.

The measurement of the circumference of the pelvis (by a line passing over the spinous process of the last lumbar vertebra between the crest of the ilium and the great trochanter to the symphysis) is even less valuable, since no constant relation exists between this circumference and that of the pelvic brim, and it is precisely the latter which it is wished to determine; the varying thickness of the soft parts that surround the pelvis, prevents any such estimate. But even if a relation did exist, we should not be much the wiser for knowing the length of the circumference of the inlet, since the same circumferential measurement may be associated with a considerable shortening of one or other diameter, or with no shortening whatever. At best the measurement of the circumference may, if it falls considerably below the average, lead to a suspicion of general contraction.

The external oblique diameters, i.e. the distances of the posterior superior iliac spines from the anterior superior spines on the opposite sides, have been recommended as means of diagnosing pelvic contraction, and more especially of estimating the corresponding internal diameters in cases of asymmetry, and great expectations were at one time founded on this method. The latter however have not been fulfilled, for the relations between the external oblique and the corresponding internal oblique at the pelvic brim vary so greatly, and the relation of the two external oblique diameters to one another is of so little value, that even when the two external measurements are identical, a considerable asymmetry of the small pelvis may yet be present; whilst conversely even when the former are unlike, we are never justified in inferring that the same is true of the small pelvis (cf. Gruner, *Zeitschrift f. ration. Medicin.* 1868). The external oblique measurements are only useful in confirming the diagnosis, where asymmetry of the pelvis has been already discovered.

The distance between the two posterior superior iliac spines has been recommended by Litzmann as sometimes a very useful external measurement, inasmuch as it serves on the one hand to indicate the width of the sacrum, and the width of the small pelvis which depends upon it, and on the other hand its relation to the distance between the anterior superior spines may be made use of as a measurement for the transverse width of the pelvic ring. This transverse diameter is always worthy of notice.

* Lastly, I must mention that under some circumstances the length of the conjugata vera may be directly determined through the abdominal walls (cf. also Hardie, *Obst. Journal of Great Britain*, July, 1874, p. 234). For this purpose however the latter must be pressed against the promontory, so that this measurement is not possible in pregnant or parturient women. It is only in the pre-gravid state, and soon after labour, especially at the latter time, since it is greatly facilitated by flaccid abdominal walls.

(2) Internal Measurement.

§ 484. This is best made with the hand alone. All the instruments invented for the purpose (and in not a few cases great ingenuity has been displayed) have proved clumsy and useless when compared with the hand, and this is true even of

van Huevel's pelvimeter, which is still occasionally recommended. No instruments can dispense with the guidance of the finger, none are more accurate, while they all are more troublesome and painful to use.

It is true that with the hand we can only measure with accuracy the length of the conjugata diagonalis, and are obliged to infer that of the vera from it; only when there is very great contraction can other dimensions sometimes be measured, and stated in so many finger lengths and breadths. The determination of the C. diagonalis however suffices for the great majority of cases, especially as palpation of the pelvic cavity, with the view of determining the inclination of the pelvis, the direction and height of the symphysis, the width of the pubic arch, the curvature and height of the anterior and lateral pelvic walls, the form of the anterior surface of the sacrum, its length and its inclination forwards, as well as its connection with the hip bones, the higher or lower position of the promontory, yields information which furnishes an approximately true picture of the pelvic canal. All these points therefore must be borne in mind when making an examination.

§ 485. *While the conjugata diagonalis is being measured*, the perineum of the woman must be quite free, and her sacrum somewhat raised; the latter either being managed by an assistant placing his hands beneath it, or by the woman who is to be examined raising herself, when directed to do so. The accoucheur sits at her side and introduces his index and middle fingers (only when the sagittal shortening is considerable does the index alone suffice) along the posterior vaginal wall to the vaginal fundus, in parturient women along the posterior wall of the cervical canal. The sacrum now being raised, the fore-arm is to be depressed until quite parallel with the longitudinal axis of the woman, and the perineum forced upwards, while the accoucheur seeks to reach the promontory, and places the tip of his middle finger on its most prominent spot; this usually lies directly opposite to the symphysis, in rare cases a little to one side. Care should of course be taken not to confuse the connection between the first and second vertebræ (the *second promontory*) for the true promontory, or indeed to fix upon a very jutting point of the lowest lumbar vertebra; if he has had a little practice and remembers

the construction of the bones in question he will not be led astray. When the posterior point is determined, he should raise his wrist a little and press the radial side of his finger against the sharp inferior edge of the arciform ligament, marking the point of contact with the nail or with the tactile surface of the index finger of the free hand; whether the latter is directed upwards (Michaelis) or downwards during this manœuvre matters not, but he should avoid including the soft parts lying just below the arciform ligament. The fingers should be retained in exactly the same (adducted) position which they held during the measurement, while they are withdrawn from the external generative organs, when the distance from the tip of the finger to the mark of the nail may be read off with callipers.

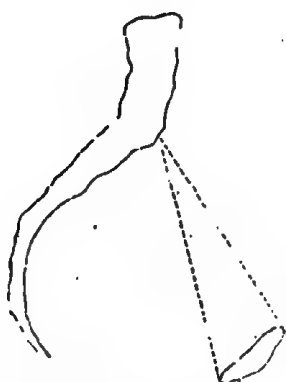


Fig. 78.—Normal inclination of the symphysis.

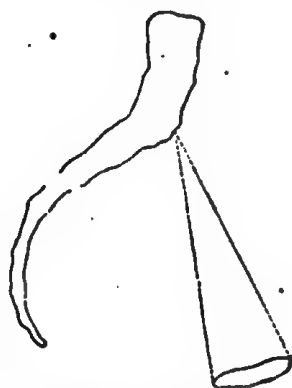


Fig. 79.—Unusually horizontal symphysis (diminution of the angle).

When the length of the *C. diagonalis* has thus been ascertained, and the knowledge of this is in itself of importance, *the length of the C. vera must next be determined.* In a normal condition of things the difference between the two (§§ 17, 20) amounts to 1.5 cm. (.6 in.), or to nearly 2 cm. (.8 in.), if, as is a better method, the obstetrical *C. v.* is used, *i.e.* the distance of the middle of the promontory from the point on the posterior edge of the symphysis which is nearest to it. But there would be the risk of making a serious, possibly a very calamitous, mistake, if the practitioner contented himself with deducting in every case an average measurement of 1.8 cm. (.7 in.), as is usually recom-

mended. For the amount to be deducted varies greatly in different cases; the minimum and the maximum which I have found in examining contracted pelves in necropsies were 1 and 3 cm. (.4 and 1.2 in.).

§ 486. *The amount to be deducted varies with the angle which the symphysis makes with the C. v., with the length of the symphysis and with the height of the promontory: these are the three determining factors.* In regard to the angle between the C. v. and the symphysis, it must be obvious that the greater this angle, the more steeply the symphysis descends ("the more vertical it is"), the more will the anterior terminal point of the C. d. be removed from the posterior, and the longer will that conjugate be in comparison to the C. v.; and conversely the more horizontal the symphysis, the more it slants, the shorter relatively will be the C. d. (cf. figs. 78—80). *A steep anterior pelvic wall therefore increases the amount to be deducted, a horizontal one diminishes it.* Further, the greater the distance between the anterior terminal points of the conjugates, i.e. the longer the symphysis, the greater will be the amount that must be deducted. I have frequently made measurements on corpses of lying-in women, and can state that with a length of 4 cm. (1.5 in.) and less, the amount to be subtracted is about 1.5 cm. (.6 in.); with a length of above 4 cm., about 2 cm. (.75 in.). Again, it is easy to see that *where the promontory is placed very high, the amount to be deducted must increase, and vice versa*, since as the promontory ascends, it becomes more rapidly removed from the anterior terminal point of the C. d. than from that of the C. v.; consequently the former will be relatively increased.

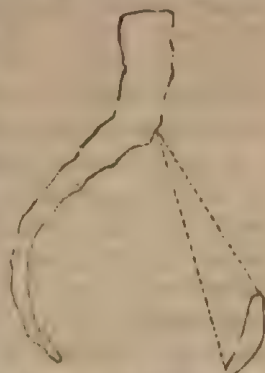


Fig. 80.—Steep symphysis (increase of the angle).

These three determining factors can be more or less accurately estimated in every person. The height of the symphysis can be directly measured, if the index finger is passed into the vagina and upwards along the urethral swelling; while the inclination of the symphysis and the elevation of the promontory above it can easily be estimated with approximate exactness. If the several

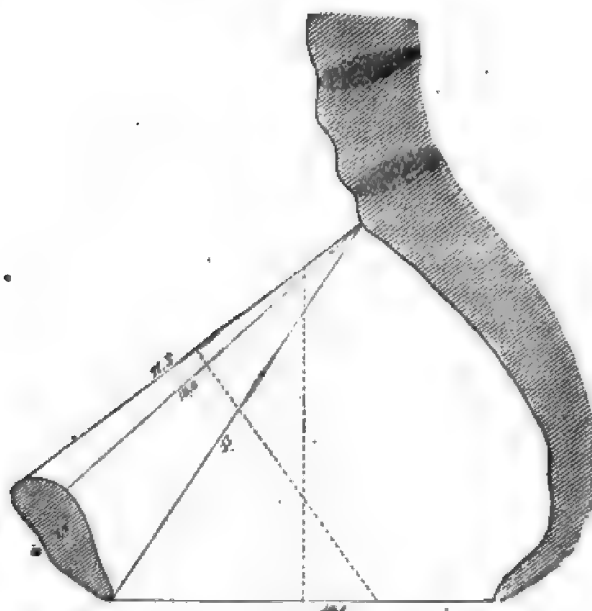
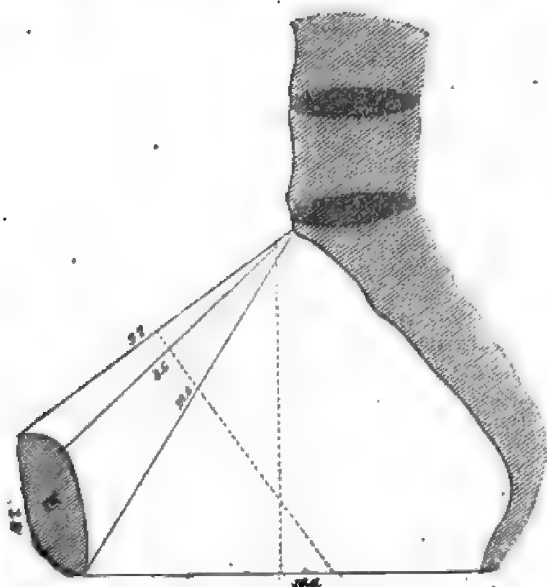
Fig. 81.—Normal pelvis¹.

Fig. 82.—Ordinary flat pelvis.

¹ The numbers in this and the three following figures refer to centimetres (Tr.).

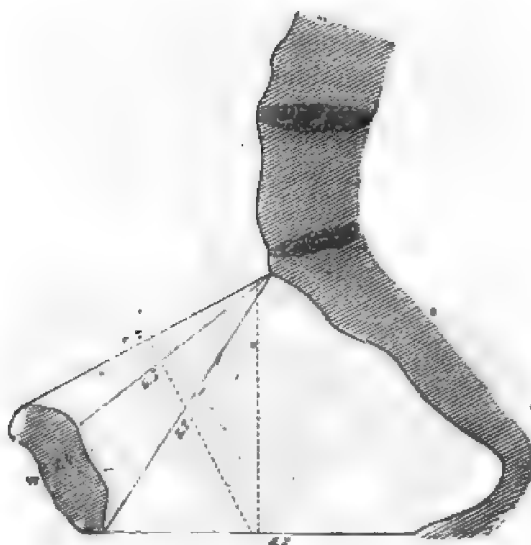


Fig. 88.—Rickety flat pelvis.

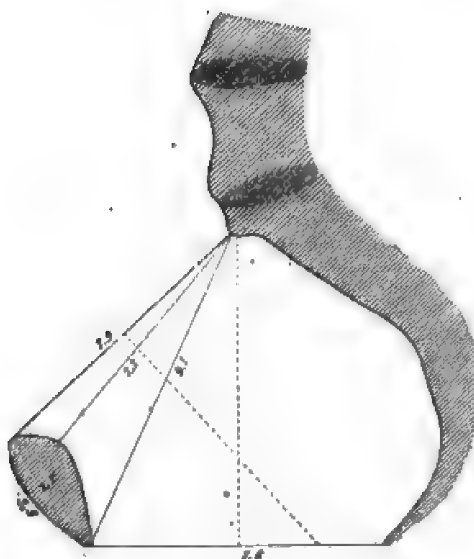


Fig. 84.—Generally and uniformly contracted pelvis.

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The other diameters are normal or (and this is especially true of the transverse diameter of the brim) slightly elongated.

Flat pelvis may be divided into two varieties according to their mode of origin, viz. a *non-rachitic* and a *rachitic* variety.

§ 490. The *flat, non-rachitic pelvis* is the commonest contracted pelvis, if we include the minor degrees of contraction (they are

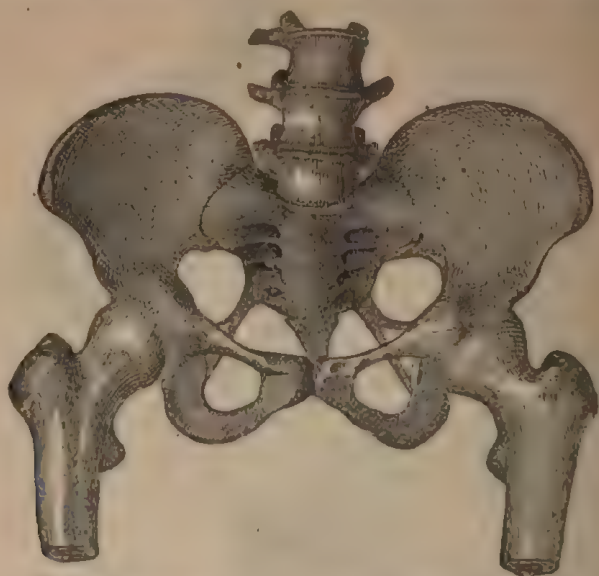


Fig. 85.—Simple flat pelvis, $\frac{1}{4}$ nat. size. (Breslau Maternity¹.)

¹ J. G., *Clinique*, 1867—68. No. 76.

Pelvic measurements (prepared pelvis).

Sp. l.....	27	cm. (10.5 in.)
Cr. l.....	25.5	" (10 ")
C. e.....	16.5	" (6.5 ")
C. d.....	9.5	" (3.75 ")
C. v.....	8	" (3 ")
Transv. of brim.....	13.5	" (5.25 ")

Abt. 24, strong healthy primipara.

1st period of labour 24 hours. Head above the pelvis in a first vertex position; has deviated considerably to the left; right side of the pelvic brim not entirely occupied. Sagittal suture displaced far towards the anterior pelvic wall. Soon after the discharge of the amniotic fluid the child was turned and extracted; much difficulty in turning and extracting of the head by the French method (Levret, *op. cit.* § 912); boy of 3350 gram, and 54 cm. in length (7 $\frac{1}{4}$ lb.; 21 in.); still-born; deep depression on the right temporal bone caused by the promontory. The mother died on the 4th day *post partum*: cervix deeply bruised (*l'air*) on the left side, endometritis, parametritis purulenta, septicæmia.

frequently overlooked owing to the fact which has already been mentioned, that they frequently do not materially interfere with the course of labour); at any rate this has been my experience here. The flattening is often due to the sacrum having advanced deeply and far forwards between the iliac bones, without any co-existing rotation round its transverse axis; its inclination therefore is not increased, indeed not rarely diminished. The shortening in the sagittal direction is never very considerable, and the conjugata vera rarely measures less than 8 cm. (3 in.); the sagittal diameter of the cavity however is also a little diminished, the entire sacrum having advanced. The sacrum moreover is at the same time somewhat smaller than normal, a fact which would cause a diminution in the other diameters of the pelvis, did not the increase in the transverse width of the pelvic ring which is associated with the advance of the sacrum counter-act such diminution. A so-called second promontory (*i.e.* a prominent union between the first and second sacral vertebrae) is only found in the severer forms, and when the sacrum has moved very far down. In other respects the bones are of the usual structure and shape, and the subjects of this anomalous pelvis can rarely be suspected, for they present every variety of stature and physique, although it is true that the majority are small individuals who have not attained the average development. The more this is the case, the more does the flat pelvis approach the uniformly contracted one, and of course there are gradational forms between them.

§ 491. The *aetiology* of this abnormality is not quite clear, for neither the history of the patient nor the structure of the bones point to definite lesions. Delayed ossification, with premature and excessive weighing down of the sacrum, is probably the reason of its being displaced so far down and forwards. Many of the affected individuals have developed slowly in their later childhood, and in some cases doubtless a rachitis which has never developed completely, or which has again retrograded may be assigned as the cause. At any rate in accordance with the above explanation is the fact that the majority of cases of contracted, and especially of flat, pelvis occur amongst the poorer classes, whose children are obliged, before their development is complete and for long periods at a time, to carry weights that are too heavy for them.

§ 492. The malformation under consideration can scarcely be *diagnosed*, except by measuring the pelvis; external appearances rarely lead to its detection, for the pregnant women do not show any marked characteristics. The dist. Sp. I. and Cr. I. are little altered; sometimes, and this is the commonest, they present the lower limits of the normal, but sometimes they are of average length; their relation is generally the ordinary one, although not infrequently the difference between the two is small; only in exceptional cases is there no difference at all. On the other hand the C. e. is considerably diminished, and this is also true of the amount to be deducted from the C. d., from which, owing to the low position of the promontory and to the usually slight length of the symphysis, scarcely more than 1.5—1.8 cm. (.6—7 in.) has ever to be deducted in order to obtain the C. v. Further light is thrown on the nature of the deformity by the almost invariably diminished distance between the posterior superior iliac spines, and by the difficulty of palpating the lateral walls of the pelvic cavity to any great extent. The inclination of the symphysis is variable, but I have frequently found it steeper (cf. § 486) than in the non-rachitic variety.

§ 493. *The Rickety Flat Pelvis.*—There is no immediate connection between a particular kind of rickets and the resulting pelvic deformity, for the latter is simply due to the disease affecting the formation of growing bone. The point of greatest obstetrical interest is the fact that the ossifying masses, i.e. the periosteal thickenings and the cartilaginous layers which line the fully ossified bone and which are about to become ossified, are disturbed in that process, while medullary spaces continue to form in the same way as they did in the recently formed masses of bone. Any portions of bone however that are already fully ossified at the time when the disease begins, retain their solidity, and their structure is scarcely altered; indeed they may be strengthened by additional deposits. Thus a pelvis which has been attacked by rickets, consists of a number of firm bony centres, whose surface is covered by soft layers, and which are connected with one another by considerable layers of cartilage (intervening between the diaphyses and epiphyses), from which new portions of bone will in time develop. The very soft and yielding character of these cartilaginous masses allows the portions of bone which they connect to be displaced over one another, and

causes compression of the portions of cartilage themselves and curvatures of the bones, whose form is fully developed, although they only possess a thin incrustation of true bone.

These changes in the shape of the pelvis are produced on the one hand by the traction and pressure of the muscles, on the other by the pressure which is exerted by the weight of the trunk, and by the counter-pressure at the hip-joints. To these factors moreover must be added the influence of the abnormal growth of the diseased and recovering bones; *for the growth of the bones is often hindered in consequence of the rachitic processes, and the pelvic bones are very apt to retain something of their fetal form and diminutive size.*

I have already shown, when describing the fetal rachitic pelvis (§ 385), how powerful a traction and pressure may be exerted by muscles, and their importance has been clearly demonstrated by Kehrer. We should therefore expect *a priori* that the plastic effect of the weight of the body would not be small, and this is borne out by the various kinds (so similar in their fundamental characters) of rachitic pelvis. In §§ 28—29 we explained how this weight of the body acts in giving form to the pelvis of the new-born child. In much the same way where the sacral vertebrae are displaceable under pathological conditions, this weight drives them further forwards and downwards, and presses the promontory forwards and downwards. The lower position of the upper division of the sacrum next begins to pull down the sacral portion of the iliac bones, so that instead of lying next the sacrum they partly roof it over above and behind; in consequence of this traction moreover the iliac bones assume a more horizontal and divergent direction. This horizontal movement meets with but little resistance, and hence the *linea arcuata interna* takes a more outward course, and the acetabula look more forwards: lastly, this horizontal movement has a tendency to draw the pubic bones out transversely, so that the angle which they usually form, viz. that opening towards the pelvic cavity, is almost entirely obliterated. Further, curvature of the spinal column or lower limbs may render the pressure relations unequal on the two sides, in consequence of which the sacrum is forced to one side and twisted round its longitudinal axis.

In the severer forms of rickets even the portions of bone that

are already well developed at the onset of the disease possess only an extremely slight power of resistance; indeed the latter is as much diminished as in osteo-malacia. When this is the case, the rachitic bones are entirely comparable to the latter as regards the effect of muscular traction and the weight of the body, and thus originates the *tri-radiate rickety pelvis*.

The textural changes of the bones which accompany the rachitic processes, disappear on recovery, and the bones seem to have the usual structure at the termination of the disease. But in many cases they look extraordinarily thin and even translucent (atrophy), in others abnormally thick and solid (hyperostosis). Any alterations of form however that have arisen persist, and to



Fig. 86.—Rickety flat pelvis (Breau Maternity). 1 nat. size.

* A. G., *Gynaecological Clinique*, 1872—73, No. 39.

Was delivered spontaneously in this Maternity in 1868—69, labour being premature. Afterwards suffered from acquired prolapsus vaginae, and was operated on for this by my assistants in the Easter holidays 1878. Died from pyæmia.

Measurements of the pelvis.

Sp. I.....	21.5	cm. (9.5 in.)
Cr. I.....	21	" (9.25 ")
C. a.....	15	" (6 ")
C. d.....	9.75	" (3.75 ")
C. v.....	6.75	" (2.50 ")
Transv. of brim.....	13	" (5 ")

Person of small stature, with very crooked thighs and shallow pelvis.

them must also be added a certain retardation in the development of the length of the bone.

§ 494. The following peculiarities will therefore accompany a rickety pelvis (figs. 86 and 87). The gravid woman is as a rule of small stature and thick set; the lower limbs are remarkably short, often very thin; the vertebral column is not uncommonly curved, and the gait waddling. The hips are wide, the lumbar region pressed in, the buttocks widely separated, the anal sulcus is absent or very short; sometimes the anal opening actually lies freely exposed between them. The sacrum is driven downwards and forwards between the iliac bones, and is at the same



Fig. 87.—Rickety flat pelvis (Breslau Maternity¹). $\frac{1}{2}$ nat. size.

¹ E. S., *Clinique*, 1866—67. No. 108.

Pelvis somewhat asymmetrical. Promontory placed very low.

Sp. L.....	23.5	cm. (9.25 in.)
Cr. I.....	21.5	" (8.5 ")
C. e.....	15	" (6 ")
C. d.....	8	" (3 ")
C. v.....	6.75	" (2.5 ")
Transv. of brim.....	13.5	" (5.25 ")

(immediately in front of the promontory).

Small graceful figure, with crooked thighs; æt. 32, primipara. Premature discharge of liquor amni, period of dilatation very prolonged (50 hours). Presentation of the posterior parietal bone. When the os was sufficiently dilated, and after the death of the child (labour had lasted 58 hours), perforation and extraction were performed with hook and bone forceps. Mother died on the 8th day from metritis and lymphatic septicæmia. Diphtheritic inflammation of the bladder.

time rotated round its transverse axis (which passes through its upper portion) in such a way that the base is inclined unduly forwards, and often does not form more than a right angle with the lumbar vertebræ, while its upper half runs almost horizontally backwards. In such a case the lower end is bent sharply forwards, in consequence of its being firmly connected with the side walls of the pelvis, and together with the *coccyx* projects hooklike into the pelvis. The *promontory* is low, while its sharp lip encroaches upon the pelvic brim, and not uncommonly (as already remarked) deviates to one side. While the usual curvature from above downwards is thus greatly changed in consequence of the rotation round the transverse axis, the transverse curvature of the anterior surface is also lost, inasmuch as the bodies of the vertebræ are bulged forwards, and lie almost in a plane with the *alæ*. For this reason too there is very frequently a *second promontory* between the first and the second vertebra, the union between the latter not having undergone ossification; and this is all the more deceptive when the two vertebræ are so united, as to form an angle pointing forwards. The *iliac bones* are small, lie very flat and diverge greatly in front, in consequence of which the distance between the anterior superior spines is both relatively and absolutely increased; it approximates to, and sometimes exceeds, that of the crests. The *ischial bones* diverge below, and their tuberosities seem drawn somewhat outwards and forwards. The same is true of the descending rami of the *pubic bones*, a condition which causes the pubic arch to be greatly widened, and its pillars to be twisted outwards. The horizontal pubic rami are flattened, the *linea arcuata interna* is markedly curved, or even bent at an angle. The symphyseal cartilage usually projects strongly towards the pelvic cavity, and the crest of the pubes is not uncommonly unusually sharp, and frequently terminates at the point of insertion of the *psoas muscle* in a sharp spine (*pelvis spinosa, akantropelys*—Kilian).

§ 495. The pelvis thus appears squeezed together from above downwards, and from before backwards; moreover it is low and very much flattened, so that the shape of the brim varies from that of a simple transverse ellipse to that of a kidney or even a heart. The C. v. is the diameter which is most affected (I once found it as short as 6.3 cm. = 2.5 in.); the transverse

and oblique diameters of the brim and cavity are either not shortened at all, or actually lengthened; at any rate they greatly exceed the sagittal. In passing downwards towards the pelvic outlet, there is usually an increase in both directions; asymmetry of the several bones is no rare phenomenon. I have already called attention to the oblique displacement which is sometimes present¹.

If the alterations in shape that have just been described, are borne in mind, it will be easy to *diagnose* the rickety flat pelvis. Special weight is to be attached to the altered relation of the dist. Sp. I. and Cr. I., to the slight distance between the two lines conceived of as connecting spines and crests, to the proximity of the posterior superior spines to each other, to the marked diminution of the C. e., to the form and direction of the sacrum and of the pubic arch, to the width of the lower aperture, and to the very jutting and low promontory. It is in these cases that the amount to be deducted from the C. d. reaches the highest figure, although it is also true that it varies enormously (cf. §§ 485 and 486).

(2) *The Generally and Uniformly Contracted Pelvis.*

§ 496. This is the rarest of the ordinary forms of contracted pelvis. The various diameters of each of the apertures are nearly (rarely quite) equally contracted, without any other deformity, and without any structural change in the bones or their connections. The development of the pelvis appears to have been arrested, before being completed. There are 2 or 3 varieties of this anomaly:

(1) The pregnant woman is of ordinary stature, sometimes short, sometimes tall, sometimes thin and graceful, sometimes stout. Her pelvis has the usual female characters, but on a reduced scale; its bones are delicate and thin, or else compact like those of the male pelvis (*reduced pelvis*, Nægele). The alteration however does not consist merely in a reduction in

¹ The *skoliotic rachitic pelvis* has lately received special attention from Leopold (cf. *l. c.* and Literature). The characteristic rickety peculiarities are not diminished by the skoliotic curvature of the vertebral column, i.e. the unequal action of the weight of the trunk. But the pelvis becomes unsymmetrical, the plane of the brim assumes an obtuse, obliquely distorted "ace of hearts" outline, with a compression (i.e. contraction) on the side of the lumbar skoliosis and a widening on the other side. In such a case the outlet has the opposite relation.

size, for some of the peculiarities of the infantile pelvis still remain. To the latter belong the diminished width of the sacrum, particularly of its ala, in comparison to the width of the body; the relative shortness of the limbs of the lower pelvic half-ring, measured from the ilio-pectineal eminences to the middle of the upper border of the symphysis: the but slight projection of the sacrum between the iliac bones, so that its posterior surface scarcely lies in front of the plane of the posterior superior iliac spines; the diminished inclination of the sacrum and its marked transverse concavity, as well as the slight flexure of the lower half upon the upper; the relatively great distance between the posterior superior iliac spines; the not uncommonly slight inclination, *i.e.* steepness, of the anterior pelvic wall.

(2) The pregnant woman is of small, or even dwarfed, stature. Her pelvic dimensions correspond with the general diminution



Fig. 88.—Dwarf pelvis, clinical history unknown (Breslau Maternity). $\frac{1}{4}$ nat. size.

Sp. I.	18.5	cm.	(7.5	in.)
Cr. I.	18.5	"	(7.25	")
C. v.	8.3	"	(3.25	")
Transv. of brim...	11.7	"	(4.6	")
Oblique of brim...	11.25	"	(4.4	")

in those of the skeleton—*dwarf pelvis* (fig. 88). At the same time its form is genuinely female, while the bones are delicate and small, and connected with each other by cartilage, much as in a child; especially is this true of the sacral vertebrae. The dwarf pelvis is very rare, and appears often to be dependent upon an inherited predisposition. It is in this kind of pelvis that general contraction is found most marked. The latter however is not always equally

distinct in the different pelvic regions, sometimes increasing below, sometimes decreasing.

(3) In individuals who are ill developed in every respect, both bodily and mentally, and in whom the generative apparatus is also undeveloped, the pelvis almost always presents the infantile type, both as regards the shape, size and connections. Where the generative parts are imperfectly formed, the pubic arch is pointed, as in the male pelvis, and the eversion of its pillars is

absent; moreover the pelvis is contracted, especially in a transverse direction. This pelvis is only of obstetrical interest, when the deficient development is of limited degree (moderate cretinism); pregnancy does not occur in the severer cases.

It is therefore only the first of the three varieties referred to above that has much importance, and it is also the commonest. The contraction is rarely perfectly uniform; as a rule it is somewhat greater in the sagittal than in any other direction; consequently there will be many transitional stages between it and the generally contracted flat pelvis, and in such cases doubt may be felt as to how the pelvis should be classified.

§ 497. *Uniform contraction of the pelvis is usually due to a premature arrest in the growth of the bones which ought to occur during the later years of childhood. It will only rarely be possible to demonstrate that the primary bony development was too small,*

and to exclude all later pathological processes. The cretinoid habitus is, as already mentioned, almost always associated with too small a pelvis. The arrest of growth may depend (a) upon general disorders of nutrition, e.g. serofulosis, the presence of which in the persons con-

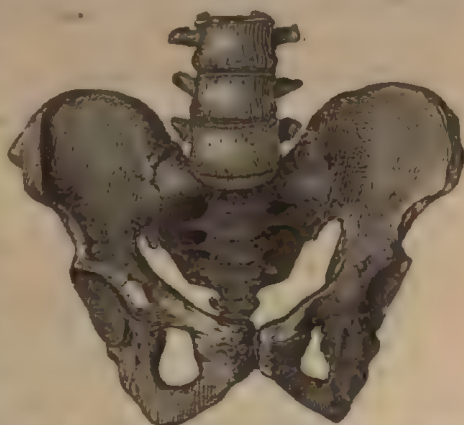


Fig. 89.—Generally, uniformly contracted pelvis (rachitic). $\frac{1}{2}$ nat. size. (Breslau Maternity¹).

cerned will not infrequently be revealed by their previous history; or (b) upon such hard work in immature individuals as compromises growth by throwing undue weight on the body, or perhaps by primarily leading to a prematurely firm connection between the separate bones; or (c) lastly upon rachitis which, apart from the deformities caused by curvature and traction, is characterised by an arrest in the development of the bones of the

¹ D. B., *Clinique*, 1871—72, No. 58.

Primipara, æt. 33. During her childhood she suffered for an unusually long time from rickets. Short, thick set, muscular. Thighs bent outwards, slight dorsal kyphosis and lumbar lordosis. Small exostoses on all the limbs. Numerous exostoses and spines

whole skeleton. In the latter case it may not always be possible to find the characteristic peculiarities of a rickety pelvis, although some evidence of it will usually be forthcoming in the position, inclination and form of the sacrum, in the sagittal contraction (decreasing below), in the sharpness of the pubic crest, and in the short or stunted lower extremities. Fig. 89 is an illustration of such a generally contracted pelvis.

§ 498. The uniformly contracted pelvis may be *diagnosed* by the sacrum being only slightly sunk between the iliac bones, and by its slight inclination; by the diminution of the various external diameters and of the pelvic circumference; by the undiminished, or even increased, difference between the dist. Sp. I and Cr. I. with slight shortening of the C. e.; by the ease with which a large part of the lateral walls of the pelvic cavity, or even the whole of the pelvic ring, can be palpated internally; by the shortening of the C. d. The amount to be deducted from the vera is as a rule about the average; but in some of these cases it

on the pelvis (some have been destroyed by careless preparation). Cf. Neuenzeit's dissertation *Beitrag zur Kenntnis d. Becken mit multip. Exostosen*. Breslau, 1872.

Pelvic measurements.

Sp. I.....	22	cm. (8.5 in.)
Cr. L.....	23	" (9 ")
C. e.	11	" (6.25 ")
C. d.	10.4	" (4 ")
C. v.	8.2	" (3.2 ")
Brim. { transv.	11	" (4.25 ")
{ obl.	9 & 9.8	" (3.5 & 3.85 in.)
{ sag. diam.	8.5	" (3.35 in.)
Cavity. { transv. "	8.5	" (3.35 ")
{ obl. "	10.8	" (4.25 ")
{ sag. "	9.5	" (3.75 ")
Outlet. { transv. "	8	" (3.1 ")

In 1869, after being in labour for 3 days, she was delivered of a dead child with difficulty (footling presentation).

She applied at the Maternity here in the evening of Dec. 6, the os being dilated, and the breech firmly impacted in the brim of the pelvis. During the night the breech descended somewhat, under the influence of vigorous pains, and was followed by the rupture of the membranes. On the 7th, labour made slow progress, but towards evening signs that the mother was beginning to suffer, showed themselves. The extraction was found difficult, indeed even after perforation my assistants were unable to deliver the head (I happened to be away at the time). I found the parturient woman at 5 A.M., during the night of Dec. 7—8th, in the highest stage of collapse, and although I succeeded after much trouble in extracting the very much broken up head, by means of the cephalothryptor, the patient died soon afterwards. (The cervix and vagina presented numerous, but nowhere perforating, lacerations. The uterine sinuses, ovaries and broad ligaments were everywhere infiltrated with blood.)

If the pelvic relations had been fully diagnosed in time, Cæsarian section should have been performed.

must often be very much increased, owing to the high position of the promontory that is associated with the slight inclination of the sacrum, and to the usually steep descent of the anterior pelvic wall. The shortening of the C. v. is rarely great, but in this form of pelvis, owing to the simultaneous contraction of all the diameters, difficulty sets in even when the length of the vera is but little diminished.

Although the diagnosis of the general contraction, and especially of that in the sagittal direction, is easy, it is very difficult to determine the degree of contraction in other directions; indeed this can only be done approximately, since it is the exception for the diminution of the diameters to be quite uniform. In the majority of cases the diminution in the transverse diameter may be set down as less than that in the sagittal. A slight degree of contraction is not infrequently only revealed by the progress of labour.



Fig. 90.—Generally contracted, flat pelvis (Breslau Maternity¹). $\frac{1}{4}$ nat. size.

(3) *The Generally Contracted, Flat Pelvis.*

§ 499. This (fig. 90) is a combination of the two principal kinds of contraction, that have just been described, and may (like

¹ O. N., *Clinique*, 1867—68, No. 119.

Primipara, æt. 26, has never menstruated. Short, slim person, 142 cm. (4 ft. 7½ in.) high.

Dried pelvis:

Sp. l.	21.5 cm. (8.5 in.)
Cr. l.	22.5 " (8.85 ")
C. e.	16 " (6.25 ")
C. d.	10 " (4 ")
C. v.	8 " (3 ")

Premature labour was induced (by Tarnier's method) a few weeks before the normal end of pregnancy. The child was born alive, but died 6 days later from intra-cranial hæmorrhage. The mother died on the 9th day from phlebotic pyæmia. (Cf. *Berliner Klin. Wochenschrift*, 1869, No. 9.)

the ordinary flat pelvis) be divided into a non-rachitic and a rachitic variety.

The *non-rachitic* variety (in contrast with what obtains in the ordinary flat pelvis) is the rarer of the two. It approximates most (from every point of view) to the generally and uniformly contracted pelvis, and can only be said to be present where, with a generally contracted pelvis, the sacrum is not placed steeply between the iliac bones, but appears pressed in deeply between them, and where the C. diagonalis or vera is very short in comparison to the general decrease of the diameters. Accordingly this sagittal shortening is only marked at the brim of the pelvis; lower down the measurements of the diameters correspond with those in the uniformly contracted pelvis. The decrease of the C. d. however may be very considerable, since not only are all the bones small, but some flattening also is present, although possibly only of slight extent. The amount to be deducted for the vera is usually very small in these cases, since the symphysis is short and the promontory lies low. In other respects what has been said above of the uniformly, generally contracted pelvis also holds good for the variety we are now discussing. Its origin is to be ascribed to the fact that the causes which lead to flattening, have in this instance acted upon a pelvis whose primary development was too small.

§ 500. The greater frequency of the *rachitic* variety (fig. 91) is not surprising, for we know that rickets is the commonest cause both of flattening, and of premature arrest of the growth of bones, *i.e.* of the two factors by which this form is produced. Nevertheless it is decidedly rarer than the ordinary flat, rachitic variety, since it is a consequence of a very early attack, as well as of an especially prolonged illness, and therefore is associated with the severer forms of the disease. The gravid women are generally of diminutive stature; the pelvis seems to have primarily developed on a very reduced scale, its depth is small, its bones are delicate and fragile, rarely thick. The rachitic peculiarities are very distinct, and often present in their entirety; sometimes however only a few can be made out. In addition to the great flattening which is thus caused, the small dimensions of the individual parts, especially the shortening of the anterior portions of the upper lateral segments of the pelvic ring, are noticeable; and hence it follows that in spite of the transverse expansion of the latter that

occurs in this form, the severest grades of general contraction may also be met with; nor are asymmetry and oblique distortion unusual.

§ 501. The *diagnosis* is not difficult. Apart from the woman's previous history and from her figure, the following are character-



Fig. 91.—Generally contracted, flat rickety pelvis (Breslau Maternity'). $\frac{1}{4}$ nat. size.

* J. J., *Clinique*, 1871—72, No. 61.

Primipara, æt. 22; small figure, obviously rickety build, very short lower limbs. 112 cm. (4 ft. 7½ in.) tall.

Pelvic measurements (in dry state):

Sp. l.	22.5 cm. (8.75 in.)
Cr. l.	22 " (8.65 ")
U. e.	15 " (5.75 ")
U. d.	9 " (3.5 ")
C. v.	7.5 " (3 ")
Transv. brim.	12 " (4.75 ")
Obl.	11 & 12 " (4.25 & 4.75 in.)

Period of dilatation lasted ca. 24 hours. Rupture of the membranes 10 hours after full dilatation of the os. Occipito-posterior presentation, in first vertex position.* The pains were good, but the hard cranium did not adapt itself to, or engage in, the pelvis. 12 hours after the discharge of the amniotic fluid, symptoms set in that showed that the mother was beginning to suffer, in consequence of which, the fetal pulse having ceased, *perforation* and *cephalotripsy* were undertaken. Death took place on the following day from the septicæmia which had started during labour (metritis, lymphatic phlegmon of the pelvis, peritonitis). The bladder presented commencing fistule, due to some circumscribed sloughing of the posterior wall.

* Cf. § 162. According to the old classification of positions, this would be the fourth (Tr.).

istic features : the slight width of the iliac bones and the fact of the iliac ala being more horizontal and divergent in front than usual ; the diminution of the dist. Sp. I. and Cr. I. with lessened difference or even a reversed relation ; the unusually distinct rachitic form of the sacrum (showing all the characteristics) ; the very small distance between the posterior superior iliac spines, the marked shortening of the C. e. ; the still more considerable shortening (relatively speaking) of the C. d., a large quantity having to be deducted for the vern, owing to the symphysis being almost vertical in these cases ; the facility with which the lateral walls can be palpated internally. The lower half-ring of the pelvis is much less expanded transversely than the upper, indeed the lateral walls of the anterior half of the pelvic cavity are apt to be flattened owing to the pressure on the acetabula ; thus the brim is somewhat pressed in towards the symphysis and pointed in that direction. For this reason too the longest transverse diameter lies far behind the transverse median plane, near to the promontory ; or it may even be bisected by the latter, so that even when it is not shortened, it may be of no obstetrical value. Beyond the brim the size of the diameters corresponds very much to that found in the generally and uniformly contracted pelvis ; but sometimes the width is greater than would be expected from the size of the brim.

b. Course of Labour.

§ 502. Pelvic contraction has an influence on all the factors of labour : on the attachment and position of the uterus, the presentation, position and attitude of the fœtus, the "pains", the canalisation of the cervix, the condition of the bag of membranes, and the mode of transit of the fœtus. Although of course this influence is exerted in a purely mechanical manner, yet it modifies, in proportion to its intensity and nature, and in a variety of ways, the immediate obstruction which the contraction presents to the progress of the fœtus, increasing that obstruction in an unfavourable, and annulling it in a favourable, case. Hence, except in the severer degrees of deformity, the progress and issue of a labour are never determined simply by the degree of the contraction.

§ 503. The influence of pelvic contraction begins to show itself during the last months of pregnancy. The uterus seems to

lie higher in the abdominal cavity than usual, and is also abnormally movable (*pendulous uterus*). Sometimes the *higher position* is only apparent, and due to the fact that the length of the abdominal cavity is greatly reduced in these frequently diminutive individuals, a condition which causes the uterus to project far into the epigastrium; or to deviate much to one side. But in other cases the elevation is really increased, although the lower uterine segment lies as usual in the brim of the pelvis; and when so, the body and fundus project further up owing to the inability of the lower segment to admit a large part of the fœtus in consequence of the contraction of the brim. The latter circumstance is also the main cause of the *great mobility of the uterus*, since the fœtus can no longer fix the lower portion of the latter sufficiently against the pelvis, as it does under normal conditions. For this reason the higher forms of this mobility are generally seen in multiparæ, partly because the resistance of the abdominal walls has been diminished owing to some former difficult labour, and partly because the ligaments, which fix the uterus to the pelvis, will also have been stretched (owing to the same cause); nevertheless I have not infrequently met with a *pendulous uterus* in primiparæ. It is obvious that under such conditions a *pendulous abdomen* will almost always be produced; and it will be so all the more readily, the narrower the inlet, the more of lordosis there is in the lumbo-sacral region of the vertebral column, and the more flaccid the abdominal walls are in consequence of previous pregnancies. For further particulars on this point I must refer to § 284.

§ 504. The unpleasant symptoms to which pelvic contraction sometimes gives rise during pregnancy, are usually of a very trivial nature. The one important result of such contraction and of the deficient fixation of the uterus and presenting part is the frequent *abnormality in the "lie" (cf. Vol. i., p. 127) and attitude of the fœtus*. Not only is the fœtal lie much less stable during pregnancy than with a normal pelvis, but the same influence also makes itself felt during labour to an almost equal extent. Out of 680 labours in contracted pelves, I only find 573=ca. 84·3 p. c. vertex presentations, i.e. ca. 12 p. c. less than usual; 18 face presentations=2·6 p. c., 6 brow presentations=1·0 p. c., 33 pelvic presentations=4·8 p. c., and 50 transverse presentations=7·4 p. c. The frequency of abnormal lie therefore

amounts to 16 p. c., i.e. ca. 4 times as much as under normal conditions. Moreover the great frequency of face, brow and transverse presentations is especially noticeable; indeed the latter occur 9 times as often as usual, a ratio which entirely coincides with the results of other observers (Michaelis, Litzmann, Schröder). Further, the instability of the fœtus is prolonged right into labour; it is not uncommon even after the parturient activity is in full swing, for the transverse lie to be converted into the longitudinal, and *vice versa*. These abnormalities increase nearly in proportion with the number of deliveries: they are also the cause which leads to the often apparently anomalous form of uterus which is associated with pelvic contraction.

In addition to the abnormal proportion of face and brow presentations, we must also note the frequent presentation and prolapse of the limbs and cord. This frequency even in head presentations is 4—5 times greater than under ordinary conditions, and explains why the presentations of the foot are so very much more common in contracted pelves than are presentations of the breech.

§ 505. Apart from the abnormal mechanical conditions by which labour is so frequently accompanied, its actual progress, i.e. the purely *mechanical sequence of events*, is modified by the obstruction to the entrance of the head into the brim, even when circumstances are otherwise favourable. This obstruction of course does not always make the spontaneous transit through the pelvis absolutely impossible; for, as we know, the passage into, and through, it is often enough accomplished, although with more or less difficulty; it is only in the severer degrees that the head remains permanently above the pelvis, and then it can only be delivered by artificial means. It is only where the contraction is considerable that the want of room is the predominating character; in the slighter cases the degree of difficulty depends on all those factors which in a normal pelvis tend to obstruct or promote the progress of labour; also, as already remarked, upon the behaviour of the uterus, its canalisation, on the condition of the bag of membranes, on the "pains", on the size and resistance of the fœtal head, and not least on the mode in which the head engages, and on the mechanism which is best suited to the form of pelvis. Thus under some

conditions, even when the disproportion is great, delivery may pass off not only successfully but comparatively easily, while in cases where there is more room it may be rendered excessively difficult by an unfavourable action of those factors. But *the obstruction always leads to delay, to a prolonged duration of labour*, although no rule can be laid down in this matter, and the duration is not altogether in proportion to the degree of contraction. In minor cases the duration is only relatively increased, the increase affecting sometimes the whole course of labour, sometimes only one of its stages, and, as would be expected, especially that of expulsion or particular portions of it. Extraordinary delay may occur without doing harm; I have seen spontaneous delivery after a total duration of 60—72 hours, although it is extremely rare under such circumstances for the issue to be favourable. As a general rule matters must not be allowed to go on so long, owing to the dangerous sequelæ of protraction of labour.

§ 506. But although the amount of available space is not the only factor which determines the progress of labour, yet it is the most important, and the significance of the others will only be grasped, when compared with this one. It is a good plan therefore, especially for guidance in practice, to distinguish *different degrees of contraction*, so as in an individual case at once to know pretty well how much difficulty is likely to occur, and what will be the probable termination. Treatment is largely regulated by such considerations.

From this point of view *four degrees* of contraction are distinguished, although they cannot be sharply defined from one another. To the *first degree* belong pelves with a C. v. of 8·5 cm. (3·25 in.) and above. Labour in these cases almost always passes off spontaneously and successfully, cases of general contraction however being apt to form exceptions. Not uncommonly indeed progress is easy, and the presence of contraction is only revealed by its influence on the mechanism of labour. In difficult cases artificial assistance, if required, generally leads to a favourable termination.

The *second class* includes pelves with a conjugata vera of 8·5—7 cm. (3·25—2·75 in.). Labour will only be spontaneous and successful with a flat pelvis, and then only where the conditions are very favourable. The spontaneous course of events is very

slow, the maternal parts as well as the fœtus being exposed to great pressure and to its consequent dangers. Nevertheless operative interference may even here bring matters to a happy issue. But the more the C. v. falls under 8 cm. (ca. 3 in.), the more uncertain will such an issue be; the child will rarely be saved, and will frequently require mutilation. With this degree of contraction everything hangs on the form of the pelvis, the size of the child, the possibility of its becoming adapted to the pelvis, &c.

The *third group* includes pelves with a C. v. of from 7—5.5 cm. (2.75—2.25 in.). All of these oppose an insuperable obstacle to spontaneous delivery, and parturition is impossible apart from mutilation of the fœtus. If the patient will not, or cannot, consent to this, an artificial exit must be found for the child (Cæsarian section).

The *fourth group* includes cases in which C. v. is less than 5.5 cm. (2.25 in.). Here delivery is *absolutely impracticable*, even with mutilation of the child; the performance of the latter operation or the manipulation of the requisite instruments is either impossible or extremely injurious to the mother. Those proceedings are as dangerous as Cæsarian section, if not more so; hence the latter is alone admissible.

Since neither spontaneous nor artificial delivery are any longer possible in the 3rd or 4th group, consistently with the life of mother and fœtus, we may speak of them as *absolute pelvic contractions*. An exception however may now and then occur at the upper margin of the third group, where the conditions are especially favourable.

§ 507. We may now consider the various phenomena that are associated with the progress of labour, beginning with the *condition of the bag of membranes* and with that of the *cervix*. We have shown in §§ 155 and 156 how greatly the regular dilatation of the latter, and the proper action of the former depend on the head descending regularly as canalisation proceeds, and on its helping to shut off the fore-waters (§ 156). If however the head remains above the pelvic brim, the lower segment of the uterus hangs down lax and empty, so that the head cannot exert any dilating action during the "pain"; while on the other hand, at the several points where the head presses the wall of the cervix against the brim of the pelvis, it prevents the

liquor amnii from exerting its dilating influence in a horizontal direction. The result of this is that the process of expansion raises the uterine wall from the head at the other points, and the liquor amnii thus flows past it. The same condition obtains also in the generally contracted pelvis, at any rate in the higher forms; in those in which the contraction is markedly asymmetrical, or where the head is placed more on one side than the other, the latter is never accurately applied to the cervix, so that there is nothing whatever to prevent the liquor amnii from flowing towards the lower end of the ovum, or to prevent the latter from being surcharged by the additional quantity that is from time to time, when a pain sets in, squeezed into it. If now the cervical canal happens to be very elastic, the bag of membranes will expand it in every direction, and protrude in the form of a flattened segment of a sphere; but when that canal is resisting, then, if the membranes are sufficiently elastic, the bag bulges in the form of a cylindrical, 'sausage-shaped' pouch. If under these circumstances the head lies very high, and the isthmus of the uterus is very resisting, the bag of membranes may be constricted by it at the level of the latter, and hang down into the stretched cervix like a stalked pouch.

These then are the conditions which *cause the bag of membranes so frequently to rupture prematurely*. Such rupture on an average takes place all the earlier, the less symmetrically a segment of the head can engage in the brim, and the less completely it can block this up. The pressure to which the membranes are subjected at an early period, at the points where the head is pressed against the pelvis, also tends to cause premature rupture, and this pressure too will be greater, when the contraction is very unsymmetrical.

§ 508. After the discharge of the amniotic fluid, the head remains *in situ*, and does not complete the dilatation of the cervix, or maintain that which has been already effected, as it does when the pelvis is normal. If the previous dilatation was complete, the walls and edges of the cervical canal collapse, and form soft and loose folds hanging down in front of the head. If such dilatation was, as is usual, incomplete, the lower portion of the canal continues to form a resisting, cylindrical passage lying in front of the head. In most such cases, complete dilatation &c. is then effected by the internal os being more and more

retracted upwards as the "pains" grow stronger, and drawing the edge of the external os up with it; while on the other hand the head which is gradually descending, dilates and fills up the lower division of the cervix; the latter process is materially favoured by the formation of a caput succedaneum. If however the head cannot advance, when the internal os undergoes retraction, then the latter pulls the vagina up with it, and a time comes when the head, which is lying above or in the brim, is only surrounded by the lower portion of the cervix and by the upper portion of the vagina, and during which, under the influence of the "pains," it is very apt to break through at the part of least resistance, viz. at the edge of the os and the fundus vaginæ. In other words rupture of the uterus or vagina takes place. In such cases as these in which the internal os has become greatly retracted and the lower segment of the uterus enormously expanded, the margin between the latter and the active body of the uterus (*cf.* §§ 155 and 69) may sometimes be felt through the abdominal walls, high up and not much below the navel, as a distinct deep groove, which separates the body of the uterus (which every now and then contracts) from the expanded, thin-walled lower segment, which contains the head and even the shoulders.

§ 509. In other and commoner cases, the lower portion of the cervix is fixed and jammed between the head and the pelvis; it does not yield to the upward pull, but grows tumid, and in itself forms an obstacle to delivery. The impaction and swelling (owing to the fact that the abdomen is usually pendulous and that the head is usually strongly inclined towards the shoulder which is directed backwards) almost always affect the anterior lip of the cervix, and are usually restricted to its middle portion. Rarely is the affected portion semicircular, and only where there was general uniform contraction, have I seen the swelling extend to the posterior edge and co-exist with œdema of the neighbouring vaginal wall. The pull which is exerted by the body of the uterus, as it undergoes retraction, on the impacted and thinned portion may cause the latter to tear, or rupture may take place at a stretched and tense portion lying higher up. If the edge of the pelvis is very sharp, or is tuberculated and spinous, the cervix may actually be rubbed through; indeed occasionally the very resisting lowest portion of the cervix has

been entirely separated from the upper (circular rupture, detachment of the portio vaginalis). Happily all these occurrences are rare, since before they take place, assistance is usually forthcoming; frequently also the "pains" lose their strength before such a condition arises.

For the phenomena that have just been described in the cervical canal, presuppose the existence of strong "pains"; where the latter are absent, labour runs on without noticeable progress for half a day or even entire days. The edges of the os continue to hang down loosely in front of the head, or become inflamed and thickened; and dangers then arise, unless assistance is forthcoming, merely from the persistent, even although only slight, pressure, and from the gradually developing inflammation of the genital tract.

§ 510. The condition of the "pains" is not, as many suppose, determined directly by the pelvis, but only quite indirectly, i.e. by the secondary effects that have been already described. There are no special varieties of contractile activity associated with the several forms of contracted pelvis, nor are irregular pains any commoner with a contracted than with a normal pelvis, so long as the circumstances are otherwise similar; this opinion is based on a by no means small practical experience. As a general rule the force of the pains is in proportion to the obstruction, and hence it is not uncommon to see the greatest amount of energy developed in those cases of which the sequelæ have just been in part described; and happily also we frequently see the effects of that energy in the overcoming of obstruction, provided of course that the conditions permit of such an issue. But is equally common for the conditions which are requisite for the development of an appropriate contractile activity to be absent, the disturbing influences which lead to this "inertia" being the premature and unhappily not rare escape of the whole of the amniotic fluid (which interferes with the general intra-uterine pressure), the pendulosity of the abdomen, and the abnormal mobility of the uterus. I need not here return to the subject of how these sequelæ of pelvic contraction act, but refer to the descriptions already given.

In regard to abnormal mobility of the uterus however, I may add that this, like a pendulous condition of abdomen, prevents the use of one efficient expulsive agent, viz. the abdominal

pressure, and that a considerable proportion of the inertia is to be attributed to this loss of power. In not a few instances I have seen this mobility gradually increase in the course of the same labour, which must be due to the growing exhaustion of the abdominal muscles, and particularly to the stretching and relaxation (which increase as the internal os and the body of the uterus become retracted during labour) of the attachments of the uterus to the pelvis (especially of the broad ligaments, the anterior and posterior uterine ligaments, and of the vagina). While the attachments of the uterus are thus loose, the presenting portion of the fœtus continues high, and does not properly press upon the lower segment of the uterus; in this way one of the principal provocations to vigorous contraction is lost. Further, since the attachments must become more and more loose with the number of the preceding deliveries, we can to a large extent understand why pains are mainly found to be inefficient in multiparæ; while again we have the additional fact that permanent textural anomalies in the muscle may be caused by a difficult labour, which anomalies never entirely disappear, especially with rapidly recurrent labours, not even during the developmental processes that are associated with a fresh pregnancy.

It is obvious how injurious a feeble action of the pains must be, above all with a contracted pelvis. Such feebleness is frequently the cause of the unfavourable issue, and of dangerous operations being required. Indeed inertia may always be prognosticated at an early period of labour, where the abdomen is pendulous, and the uterus very mobile, and where the presenting part remains for a long time high and very movable.

§ 511. Michaelis was the first to state, and this has since been generally confirmed, that the *dangers to mother and child as a general rule increase with the number of the labour*, although of course this statement need not be true in every individual case. This increasing risk shows itself in the greater duration of labour, in the greater frequency of irregular mechanisms and of instrumental labours, and in the higher mortality of children and mothers. The reason is to be found in the fact that the consequences of pelvic contraction which have just been described (i.e. the abnormal presentation and attitude of the fœtus, the pendulous state of the abdomen, the loosening of the uterine

attachments, and the diminished capacity of the uterine muscle for work) grow more frequent and pronounced with every additional pregnancy. Further, the fetuses of the 2nd—4th pregnancies are on an average larger and more hard-headed than the earlier ones. And lastly, it must not be forgotten that the earlier deliveries are apt to be followed by inflammatory and other changes in the neighbourhood of the uterus, which may be intensified by a fresh difficult labour, and re-appear with disastrous results.

Mechanism.

§ 512. The actual mechanism of delivery, *i.e.* the manner in which the head engages in, and passes through, the contracted brim, varies with every form of contraction, since it depends on the obstruction that is encountered. Such a position of the presenting part of the fœtus as in itself is perfectly normal, may under special circumstances be very unfavourable, and lead to the gravest difficulties during labour. For it must be remembered that delivery will only be spontaneous, indeed the head can only become fixed in the brim, when the position of the head is suited to the existing form of pelvis. When such is the case, the cranium will be moulded in virtue of its plasticity, and gradually forced into, and driven through, the brim. It must be obvious therefore how important it is that no unfavourable relations, such as a disadvantageous position of the uterus and a wrong attitude of the fœtus, should prevent the head from engaging in the most favourable manner, and that the pains should exert a sufficient pressure to mould the head. The changes which are observable in the form and position of the head, after the pains have acted vigorously for some time, may enable the practitioner to form some idea as to the degree of the pelvic deformity, of the more or less probability of a spontaneous and successful delivery, or as to the difficulties that he may still expect. As soon as the greatest circumference of the engaging portion of the head (*Basis*) is fully fixed in the brim, the obstruction due to the latter is usually at an end, and if the expelling forces continue to act, the labour terminates spontaneously; in the great majority of cases it is only the brim that is contracted, and below it the ordinary mechanism of delivery re-appears. If however the pains do not continue sufficiently

strong, artificial assistance may still be called for, even when the seat of the contraction has been passed. The same holds true for most of the cases in which the contraction continues, or even increases, lower down. But in the latter class, as indeed in all the severe forms of contracted pelvis, the pains are usually quite unable to force the largest part (*Basis*) of the presenting segment of the head into the brim.

§ 513. In the case of an *ordinary flat pelvis* the head engages with its *fronto-occipital diameter in the transverse of the brim*, since in any other except the transverse the forehead and occiput would encounter too great a resistance, either at the promontory or at the crest of the pubes; exceptions only occur, where the degree of flattening is but slight. Moreover *Nægele's obliquity* is present in a well marked degree, and the sagittal suture runs near the promontory; the reasons for this have been stated in § 158. The biparietal diameter however cannot find sufficient room in the narrowed conjugate, and therefore moves to one side, to that which corresponds with the dorsal surface of the fœtus. Hence the occiput comes to lie against, or above, the ilio-pectineal line, where the opposing force acts upon it, with the result that the anterior portion of the vertex, *i.e.* the temporal region, sinks, and the plane of the bitemporal diameter passes into the conjugate (*fore-vertex presentation*). The head thus rests in front with the region of the squamous suture on the symphysis; behind, with a portion of the posterior parietal bone (a part adjacent to the great fontanelle) against the promontory. The great fontanelle is found lying near to, and a little to one side of, the promontory, at a somewhat lower level than the small one; indeed the latter is sometimes quite out of reach, when the head is large. The anterior parietal bone on the other hand can be palpated over a large area, while the pelvis is least filled up on the side corresponding to the forehead (fig. 92).

In this position the head adapts itself to the inlet in the following way. The posterior parietal bone becomes flattened against the promontory under the action of the pains, and consequently descends, *Nægele's obliquity* growing less at the same time. This advance of the sagittal suture (towards the middle of the pelvis) is as a rule simply effected by the posterior parietal bone descending further, while the anterior remains fixed against the anterior wall of the pelvis, not by any rotation round the

fronto-occipital axis. But I have seen some exceptions to this rule, in which such rotation actually took place to a slight extent, as was proved by the fact that the squamous suture which could at first be felt at the symphysis, disappeared upwards. The head now almost always descends directly downwards, as is shown by the pressure mark, which is caused by the promontory, running from its starting-point along the coronal suture towards the temple. But I have also sometimes seen a simultaneous oblique displacement (*Vorschiebung*) towards the side which corresponds with the anterior surface of the fœtus; rotation round the perpendicular axis of the head, the occiput turning forwards or backwards, probably also occurs to a slight extent. But sooner

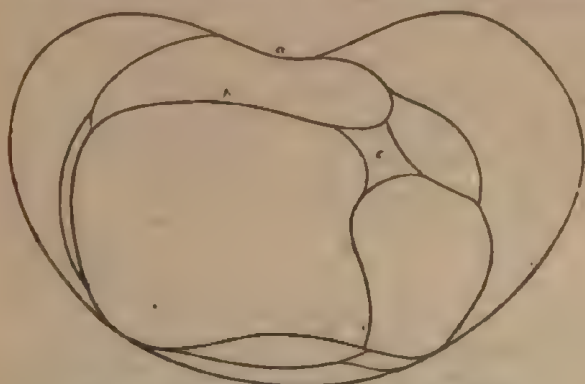


Fig 92.—Fore-vertex presentation, seen from below.
a. promontory, b. sagittal suture; c. great fontanelle.

or later the contraction is overcome by the head, which gradually becomes deeply fixed in the conjugate, rotating round the transverse axis which is engaged in the latter, and this rotation causes the occiput to descend. The great fontanelle will now be felt gradually to ascend, the small one grows more distinct and accessible to the finger, and moves nearer and nearer to the middle line of the pelvis, till the flexion of the head is complete and the occiput has come well down, when it turns forwards. All difficulty is now at an end, and the further mechanism is similar to that in a normal pelvis.

§ 514. The configuration of the skull corresponds with the mode of transit that has been described. The posterior parietal bone appears flattened, and presents local depressions, sometimes

the posterior frontal bone does so also: the anterior parietal bone is generally more than usually convex. The upper portion of the posterior parietal is pressed under the anterior, whose sagittal edge overlaps it; at the same time the lower portion of the former is frequently rotated somewhat outwards and raised, so that low down along its lambdoidal suture it seems to be further removed from the occiput. The two halves of the cranium are frequently displaced upon one another in a sagittal direction; the posterior usually backwards, as is of course natural with a fore-vertex presentation. The pressure mark, caused by the promontory, is either merely a great red patch on the posterior parietal bone near the great fontanelle, or else a streak running towards the ear and crossing the coronal suture; or it may form a line which at first runs towards the parietal eminence and then turns towards the temple, a condition which is found when the great fontanelle stood very low, and the head was squeezed in the direction of the forehead, before the descent of the occiput took place. Occasionally moreover pressure marks are found on the anterior parietal bone and even on the frontal; they must be produced by the horizontal rami of the pubes, for they are scarcely ever directly opposite the promontory mark. I need scarcely add that the marks vary greatly in distinctness, and that all sorts of combinations may occur.

§ 515. In the *generally and uniformly contracted pelvis* the head meets at the brim, i.e. *ab initio*, with an all round obstruction such as under normal conditions it only encounters at the lower apertures. It therefore enters *strongly flexed*, with the *sub-occipito-parietal plane* in the brim. The point of the occiput forms the deepest portion of the presenting segment, the nape rests against the ilio-pectineal line, the summit of the vertex and the forehead lie on the opposite side, the face looks towards the fundus uteri, the long diameter of the head lies in the axis of propulsion, and the small fontanelle is near the middle of the pelvis (*occipital presentation*). Naegele's obliquity is as a rule entirely absent; if it is present, there is almost always some co-existing flattening of the pelvis. Again it is rare for the head to engage in the transverse diameter, the sagittal suture is usually oblique; indeed if the pelvis is uncommonly round and the head not very large, the sagittal suture may lie in the antero-posterior diameter, and pass through in this way. Frequently the head

inclines first to one side then to the other, as if with no definite object, no controlling pressure being exerted from either side, and continues to do so, until it is firmly fixed by the "pains". At last it is driven in very much like a *wedge*, and flattened in width and depth by the all round pressure to which it is subjected; it is elongated in a fronto-occipital direction. If it cannot force its passage, if the brim is too contracted for this, or if the contraction increases below, the head remains at last *in situ* as if walled in, "*impacted*".

The *moulding* can in these cases only be effected by a compression of the whole head, *i.e.* by an actual reduction in size. Hence arises the cylindrical form tapering towards the occiput, the flattening of the vertex and of the frontal bones, the prominence of the face, the sliding of one parietal bone over the other, the forcing inwards and even dislocation in that direction of the tabular portion of the occiput, the great diffuse caput succedaneum, and the absence of definite pressure marks; when the latter are present, they are usually produced by the promontory on the parietal eminence or on the posterior frontal bone, according as the head lay more in the transverse or in the oblique diameter.

If the head has an abnormal position, *e.g.* if the forehead is low, or if a well marked Naegele's obliquity is present, spontaneous delivery is usually impossible. On the other hand great deviations of the uterus, irregular presentation and attitude of the fœtus, very premature rupture of the membranes are extremely rarely associated with this form of pelvis. The reasons will be clear from what has been said above.

§ 516. Amongst the three principal forms of contracted pelvis, it is the *generally contracted, flat pelvis* that *cæteris paribus* leads to the greatest difficulties and anomalies in the mechanism. Not uncommonly the head remains persistently movable in a shifting attitude above the brim of the pelvis, or else even if some segment of it is firmly pressed flat upon the brim, it shows no sign of adapting itself to the latter; this is especially apt to occur where there is great general contraction, and where at the same time the forehead is very depressed. If however the head really engages, it does so in the great majority of cases with the occiput lowest, more rarely with a low forehead. This depends mainly on the degree of general contraction as

compared with the flattening; but not entirely so, since of course the size and plasticity of the cranium have also some influence, and this is the explanation why in different labours in the same person, sometimes one position, sometimes another is met with. Even where the occiput engages, it is rarer for both parietal bones to pass into the brim, than it is with a pelvis that is generally and uniformly contracted, while the position in the oblique diameter is also rarer; the flattening is too apt to cause the head to engage in the transverse diameter and to produce Nægele's obliquity. On the other hand below the brim the general contraction has more and more influence, and only very exceptionally does the head lie transversely low down; as a rule it passes through in the oblique position. A fore-vertex presentation is, as already mentioned, the least favourable method; a spontaneous termination with this position is mainly associated with transverse dilatation of the pelvis, and under the present circumstances the necessary configuration is hindered by the transverse contraction that is present. Accordingly also I have several times seen this position even in the brim be converted into the more favourable occipital presentation, the conversion being effected by means of a rotation of the head round its fronto-occipital diameter (which was fixed in the shortened transverse diameter of the brim) and by an ascent of the great fontanelle, and conversely only occasionally have I seen the head pass through the brim, while retaining the low dip of the forehead, and seen the descent of the occiput take place below the brim, the heads being in every case comparatively small and yielding.

In harmony with the generally increased mechanical difficulties in this form of pelvis, labour also as a general rule lasts longer than with the other forms, and is accompanied by greater dangers for mother and child. Bruising and lacerations of the cervix, perforation (by friction) or sloughing of the wall of the bladder are especially common in these cases. (Out of 12 vesical fistulae which have occurred in the Maternity here, the majority were found in persons with a generally contracted, flat pelvis.) Difficult instrumental labours are frequent. The mortality of the fetuses is high; more than half perish during, or soon after, birth. The shape of the skull varies with the mechanism. The indentations and injuries of the bones which are so common under these circumstances, will be described further on.

§ 517. *There are several other modes in which the head may engage in the pelvis, in addition to those described above; they are especially common in the generally contracted, flat pelvis, although they may also be observed in the ordinary flat pelvis. In the uniformly contracted they are extremely rare; at least I never met with them. Three varieties deserve notice; presentation of the anterior or of the posterior parietal bone, and the extra-median presentation.*

When the *anterior parietal bone* (cf. also § 172) presents, there must of course be an excessive degree of biparietal (Nägele's) obliquity; the anterior parietal bone then entirely, or almost entirely, covers the brim of the pelvis, the sagittal suture runs close to, or even somewhat above, the promontory, so that the ear can be felt behind the symphysis (*anterior aural presentation*). I have generally met with this presentation, where the promontory was very high, and the conjugate greatly shortened. It is produced by the head, which is detained high up against the promontory, forcing the fundus uteri strongly upwards and forwards, while the abdominal pressure pushes it backwards to a corresponding degree, and thus bends the axis of the uterus backwards, so as to form a posterior concavity; inasmuch as the foetal axis must be similarly curved, the head inclines greatly towards the shoulder that lies posteriorly. In these cases the anterior part of the vertex is generally moderately low; in rare cases only is the small fontanelle lowest. The presentation is rectified by the parietal bone which lies against the promontory being flattened and indented, so that it gradually descends; the sagittal suture then moves downwards and forwards, while the anterior parietal bone rests with its squamous edge firmly against the upper edge of the pubic bones; in these cases however the occipital dip and rotation are not effected till at a relatively late period. This rectification is only possible when the skull yields readily to the moulding influences, and when the pains are very good; as a general rule the rectification takes so long that it is neither possible nor prudent to await its completion.

§ 518. *Presentations of the posterior parietal bone* are much rarer than those of the anterior. The posterior parietal bone in these cases covers the brim, the sagittal suture runs close to, or just behind or somewhat above, the upper edge of the anterior pelvic wall, while the squamous suture and even the posterior ear

can be felt in the neighbourhood of the promontory (*posterior aural presentation*). Here the fetal axis and usually also the uterine axis are curved in such a way as to present a posterior convexity, the head inclining towards the anterior shoulder: it rests with its anterior half above, and in a plane anterior to, the symphysis. This position is commonest where the promontory is low, the anterior pelvic wall steep, where the sagittal contraction is considerable and the abdomen markedly pendulous: the low promontory allows the posterior parietal bone to descend, while the anterior, which is resting above, and in a plane anterior to, the symphysis, is detained by the latter. Any circumstance which interferes with the normal curvature of the uterine axis (e.g. a full bladder, or a totally inactive abdominal pressure) will of course favour this position. Sometimes it is possible to detect the abnormal curvature by the external examination¹.

Rectification is occasionally brought about spontaneously by the abdominal pressure and the uterine contractions, which restore the normal curvature of the fetus; it may be assisted by pressure exerted from without over the pubic bones. But such rectification will scarcely be possible, when once the head is driven into the brim in its abnormal position, since the flattening of the anterior parietal bone which is necessary for such a change, is only attained, where there is but slight sagittal shortening and where very good pains are present. As a rule the size of the skull must be diminished, unless the better procedure of early version has been adopted.

§ 519. By *extra-median presentations* are understood those in which the head covers only one lateral half of the pelvic brim, while the other remains empty. I have seen this position several times where the brow was presenting; but it may also occur when the head is flexed (vertex presentation), and then most often where there is marked sagittal contraction with considerable lumbo-sacral lordosis, the brim being by this means divided into two equal bays. As a rule the occiput lies over the half of the brim which corresponds with the dorsal surface of the fetus, i.e. usually on the left side; but it may also, both in the first and second position, be found over the opposite; thus for instance in the first vertex position, on the right. The skull is driven into the brim in the bay in which it lies, and unless the malformation

¹ Cf. Hegar, *Berliner Klin. Wochenschrift*, No. 1, 1875.

is too great, may be driven down towards the middle of the pelvis in an oblique direction. This may be favoured by directing the woman to lie on the side which corresponds to the occiput, when this is on the same side as the dorsal surface; and under opposite conditions the woman should lie on the same side as the forehead. Generally however spontaneous delivery is impossible, and it is therefore a good plan, where the deformity appears to be great, without delay to convert the presentation into a different one; indeed in not a few cases the accoucheur has no alternative but to do so at an early period, owing to the prolapse of small parts into the empty half of the pelvis.

§ 520. *Face and brow presentations* are relatively common in contracted pelves, as has been already pointed out (§§ 174, 180 and 504), and are of course merely exaggerated fore-vertex presentations. They greatly obstruct delivery; all the more so, as even if a spontaneous issue were otherwise possible, it cannot occur owing to the too much delayed or entirely absent rotations within the pelvis (chin or brow to the front). It must therefore not be waited for, and the absence of rotation frequently destroys all chance of interfering without doing damage.

§ 521. As far as the delivery of the trunk is concerned, *pelvic presentations* run the same course as in a normal pelvis. Nevertheless owing to the obstruction at the brim there is a great danger of the arms being extended from the thorax up towards the head, particularly when (as is not uncommonly rendered necessary by the contraction) the delivery of the trunk has to be assisted by traction. Except in cases of only slight disproportion, the delivery of the head is always delayed, and it is to this delay, and to the asphyxia it produces, that is due the great danger which these presentations in a contracted pelvis cause to the fœtus. Still, although the spontaneous delivery of the head through the pelvis is extremely rare, and although the head has almost always to be delivered artificially, the accoucheur should be acquainted with the mechanism, so as to be able to undertake extraction with the minimum risk of doing injury.

With a *flat pelvis*, except where the deformity is extremely slight, the head always engages in the transverse diameter. It usually does so with the chin raised from the chest; only very rarely, and in the cases of slight narrowing just mentioned, is the chin depressed; sometimes the chin is even lower

than the occiput, but if the contraction is at all considerable, it lies at the same level with it, so that the mento-occipital diameter corresponds with the plane of the brim. When the chin then comes down either spontaneously or as a result of traction, the region of the bitemporal diameter advances into the conjugate, after which, by the posterior parietal bone gaining a slight advance over the anterior, the region of the biparietal diameter does so likewise. The promontory therefore first corresponds with a portion just in front of the ear, and then with a region passing along and behind the coronal suture towards the parietal eminence. These portions are deeply indented; so also is frequently the squamous edge of the parietal bone which is directed forwards, and which moves down along the pubic bones. Only when the head has passed completely through the brim, does the chin turn backwards in the usual manner. If, while entering the brim, the occiput lies at a lower level than does the chin, and remains so during the passage, the biparietal diameter will descend to one side of the conjugate, and the pressure mark caused by the promontory run upwards parallel with, and immediately behind, the coronal suture. In rare cases the chin is entirely tilted upwards, so that the occiput descends first; but the delivery will then be extremely difficult, even with artificial aid; usually no portion gets fixed in the conjugate, or else it only does so after the formation of deep indentations, and after fracture of the posterior portion of the parietal bone which is lying against the promontory, sometimes also of the tabular portion of the occipital bone.

With a *uniformly contracted pelvis* where the narrowing is less, the head generally passes through in a flexed attitude, and does so more easily than in the case of the flat pelvis; moreover it can be more easily rotated and extricated. The posterior frontal bone is exposed to the greatest pressure from the promontory. But in the higher degrees of contraction or where the diameters of the head are large, the passage and extraction are difficult, much as when the head goes first, for moulding processes are then quite impossible; the pressure on the lower edges of the parietal bones is extremely injurious in these cases.

The delivery of an after-coming head is most difficult with a *generally contracted, flat pelvis*, and scarcely ever succeeds spontaneously or with the help of expression. According as the general contraction or the flattening predominates, the head

enters somewhat obliquely or transversely with a depressed chin, sometimes with the chin extended upwards and in a transverse position, when indeed it does not remain entirely above the brim of the pelvis. The latter condition is extremely common under these circumstances; the chin usually gets firmly hitched over one of the pubic rami or over the ilio-pectineal line, and cannot be drawn down, so that the head must be drawn through with the occiput first. When such a course is called for, both the anterior and posterior parietal bones, and the tabular portion of the occiput are usually fractured in one or more places. Instrumental assistance is frequently required.

§ 522. As regards *transverse presentations* I will merely remark that a contracted pelvis is relatively often accompanied by a very abnormal position, *e.g.* presentation of the abdominal region, the back of the fœtus being directed posteriorly; and that the shoulder presentation sometimes only develops in the course of labour and after the escape of the amniotic fluid, this being due to the head (which primarily presented) never becoming fixed, as is afterwards shown by the pressure marks which can be seen on the head. Where the fœtus is small, and the pelvis merely a little flattened, delivery as a transverse presentation (spontaneous evolution) is possible, and has been observed¹.

c. Sequelæ for Mother and Fœtus.

§ 523. The various terminations of labour in cases where the pelvis is contracted, the sequelæ for each of the two organisms that are concerned, and the resulting risks have already here and there in the preceding sections been in part definitely mentioned, in part just indicated. They are to be explained by the reciprocal strong and long continued pressure, by the prolonged duration of parturition and in no small measure by the line of treatment adopted. Many are avoidable, but all are by no means invariably so.

The prognosis for the *mother* is better than that for the child, especially in cases of moderate contraction. It is only with a head presentation that the parturient canal is exposed to a dangerous degree of pressure; the after-coming head traverses the canal too quickly to leave severe effects behind it, although

¹C. Kleinwachter, *Archiv f. Gynakologie*, ii., p. 111.

of course rough manipulations might cause injury. It must however not be forgotten that if the tissues have become diseased owing to the undue prolongation of labour, they may be damaged even by proper proceedings which involve pressure for but a short time.

§ 524. *Actual ruptures* of the uterus and vagina are not common. They are always produced by slowly acting causes, as described in §§ 508 and 509; their onset may therefore be foreseen, and except in a few cases prevented. It is otherwise where the tissues are *contused* and *rubbed through*, owing to the long and severe contact between the head and the prominent portions of the edge of the pelvis. From the nature of things these can scarcely ever be avoided, and frequently cannot be remedied even by shortening the time during which pressure is applied. The *pressure of the promontory* always affects the cervix in these cases; I have never seen the edges of the os or even the vagina involved. The results of the pressure first show themselves on the mucous membrane, and then proceed towards the serous, producing thinning, extravasation and laceration (*Zerreibungen*), which injuries are most extensive on the mucous surface, becoming smaller and less extensive further from it. The peritoneum is not perforated except in very rare cases, but blood is almost always extravasated beneath it. The mischief is, generally speaking, severest in the portion of the parturient canal which lies against the *anterior pelvic wall*, the upper edge of the symphysis and the horizontal rami of the pubes, inasmuch as the pressure of labour is greatest and acts longest on this region. Under such circumstances the lower portion of the cervix, its lip and the vaginal fundus are invariably affected. It is rare for the tissues to be actually torn through at the time, and for a communication to be opened with the bladder; as a rule merely the mucous membrane and the subjacent tissues are torn and destroyed, and it is only the sloughing, which sets in during the following days, that leads to a communication with the bladder. That the latter however is injured from the very first is shown by the fact that the urine often contains blood even during labour, and by the subsequent cystitis. Further, *perforations leading into the abdominal cavity* and caused by sharp spines and edges are sometimes unavoidable.

But the injury done is not always restricted to the genital

canal; the *neighbouring cellular tissue* may frequently be also involved, and it is in such cases that the dangerous attacks of pelvic phlegmon supervene, with or without extravasation of blood into the tissues.

One of the severest effects of the pressure is *rupture of the pelvic articulations*. The latter are doubtless not uncommonly stretched, and this explains the occasional occurrence of subsequent inflammations, and the difficulty in progression which sometimes persists after delivery. Actual laceration however is rarely observed, although it may either follow difficult instrumental extraction or spontaneous delivery; it is commonest at the symphysis (*cf.* § 758).

§ 525. Independently of all these injuries as well as of any others that may be produced by operative measures, the mother is endangered by the prolonged duration of labour. The premature escape of the liquor amnii, the bruising of the genital tract, the admission of air into its deeper regions, which may be occasioned by the repeated examinations, lead to *endometritis and colpitis*, even during labour, and these may rapidly develop into *inflammation of the parenchyma and septic processes*. Should such conditions set in, the prognosis becomes bad, and as soon as signs of them (sensitive uterus, dryness of the vaginal mucous membrane, offensive discharge, diffuse oedema with inflammation and redness of the lower portion of the vagina and vulva, fever) appear, delivery must be terminated in the gentlest way possible for the mother. Occasionally the *exhaustion* which is brought on by the enormous muscular exertion, by the total absence of rest and proper nourishment, extending over entire days, by the injury of the pelvic organs, by the consequent inflammation and infection, is so great that the woman soon after delivery perishes in a state of deep collapse, or even dies undelivered, much as happens in cases of so-called shock.

§ 526. Pelvic contraction is much more deleterious to the *child*. The danger arises from the prolonged duration of labour after the escape of liquor amnii, from the frequency of abnormal presentations and attitudes, from the injuries to which the skull is exposed, and from the necessity of directly sacrificing the fetus in order to save the mother.

Most of the children who die during birth, perish from

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anaphyria. This need not cause surprise, for (a) the liquor amnii generally escapes very prematurely and then more or less completely, and this leads to injurious pressure on the fœtus and placenta; (b) it is only after such escape that as a rule strong pains set in; (c) the abnormal presentation and the frequent prolapse of the cord favour that mode of death; and (d) the pressure to which the cranial contents are exposed, and the secondary intra-cranial extravasations of blood kill not so much by directly paralysing the movements of the heart, i.e. by stimulating the vagus, as by making the prolongation of life after delivery impossible by paralysing the respiratory centre. The correctness of this view is proved by the fact that amongst those children that are born alive and vigorous, very few more, if any, perish during the first weeks than of those which have been delivered through a normal pelvis.

§ 527. In describing the mechanism of labour, we have already referred to the *effects of the pressure to which the head is subjected*. The following conditions may be met with:

The *caput succedaneum* does not form in every case, not even when the pressure is great. The swelling is as a rule most marked where the skull is yielding, and where the skin over it can therefore easily be raised into folds. It is rarely formed while the *membranes are intact*, but when so, it is most frequently noticed where the pelvis is uniformly contracted. This may be explained by the fact that the head in these cases is pressing the lower segment all round firmly against the edge of the pelvis, without either itself advancing under the influence of the pains or expanding that segment any more, and therefore does not transfer the intra-uterine pressure to the fore-waters, so that the pressure on the latter may sink below the level of the general intra-uterine pressure.

Occasionally a *second caput succedaneum* forms in the lower portion of the parturient canal, and when this happens, the primary position of the head cannot always be confidently inferred from the situation of the second swelling.

Marks due to previous localised pressure are very often noticed on the surface of the child; as a rule they have been caused by the promontory, more rarely by the anterior or lateral portions of the superior aperture, still more rarely by the various projections into the pelvic cavity. Patches or streaks of variable size

are thus produced, possessing a dark red colour with a slightly swollen margin, or else the patches may be excoriated and discoloured, and actually perish during labour, afterwards being thrown off as sloughs; occasionally the skin appears to have been destroyed right down to the periosteum. The severity of the injury to the tissues varies not so much with the degree of contraction, as with the time during which the pressure has acted on the affected area. When pressure has been applied in the neighbourhood of the eyes, venous congestion may result, and be followed by oedema and severe hyperemia of one or sometimes of both eyelids, with commencing conjunctivitis.

Commoner than the phenomena described above, is the displacement of the cranial bones along one another, especially of those lying in the fronto-occipital direction, and these again may have their relative positions changed; next in frequency comes the flattening of one, and the increased curvature of the corresponding, bone. We have already pointed out why, and in what places, these phenomena show themselves. The most marked plastic changes however are due to indentations and impressions. Grooves are thus formed, which run parallel with one of the sutures: with the coronal, when caused by the promontory, with the squamous, when caused by the anterior pelvic wall; in rarer cases the depressions are spoon- or funnel-shaped, of irregular triangular form, and they are then almost always placed on the parietal bone which descended along the promontory, very rarely on the frontal bone. External and also internal sub-pericranial extravasations of blood are frequently present in the affected portions. These indentations have a comparatively unimportant influence on the children¹. The deep ones are sometimes accompanied by fissures, which extend from the edge of the suture for a distance of 1—2 cm. (4—8 in.) into the bones. Actual fractures are extremely rare, and are almost always caused by forceps operations, especially when the instruments have been applied for the extraction of an after-coming head, since in these cases the skull has had no time to undergo moulding, but is often drawn rapidly and forcibly through the contracted region. The same cause may also lead to rupture of the squamous suture, or may even separate the tabular from the

¹ Cf. inter alios Kormann, *Zeitschrift f. Kinderheilkunde*, New Series, xiv., 1879, p. 241.

condylar portions of the occipital bone. Such injuries are probably always fatal, since the accompanying intra-cranial extravasation of blood involves the basal portions of the brain: hæmorrhages involving the hemispheres however may be followed by recovery.

§ 528. The mortality of the mothers and still more of course of the children is far higher than that accompanying labours with a normal pelvis. But it is hardly possible to estimate the death rate at a figure which would be universally true, since for this purpose we should require not only a large, but also a usable, collection of statistics, *i.e.* the cases in question must all have been treated on the same principles. The mortality of the mothers that have been treated in the Maternity here amounts to 7.9 per cent. (54 out of 680), that of the children to 32 per cent. ! (219 out of 682). The degree of pelvic contraction must of course materially affect the prognosis, but that it does not do so to the extent that many suppose on *a priori* grounds, is shown by the fact that in the cases of labour in a contracted pelvis which have been under my care, and in which the C. v. measured over 8 cm. (3 in.), the mortality of the mothers still reached 5 per cent., and that of the children 21 per cent.

d. Treatment.

§ 529. There is probably no question within the range of practical midwifery which is, speaking generally, so difficult to answer, in which a routine procedure is so dangerous, and in which it is so important to take all the circumstances affecting the particular case into consideration, as that which deals with the best way of managing labour, where the pelvis is contracted. As regards cases of absolute contraction, in which it is absolutely impossible to deliver a non-mutilated fetus through the contracted portion (*cf.* § 506), the proper course of action can be definitely laid down; it is the treatment of slight deformity, *i.e.* of cases of the first and second degree, that gives rise to most perplexity, since in such the remaining factors of parturition also play a very important part in determining the issue. For this reason the most exact knowledge of all the circumstances of the case is a *sine qua non*, if treatment is to be rational.

Above all is it requisite that the practitioner at an early period

become perfectly clear as regards the degree and kind of contraction. This is always the first thing to be considered, and its importance rises with the severity of the case. The less the actual contraction, the more important is it to determine the *relative contraction*, i.e. the relation between the fetal head and the pelvis, and the manner in which this relation is affected by the position, attitude, size and mouldability of the former. A knowledge of the previous history and of the course of former labours has, generally speaking, not as much significance as is often attributed to it (*cf.* § 477); still it may serve to direct the attention of the careless and inexperienced accoucheur to the difficulties that he may expect.

§ 530. It is often extremely difficult to *diagnose the position and attitude of the head*. Where the bag of membranes is intact, the difficulty arises from the high position of the head, and from the desirability of preserving the membranes entire; after the liquor amnii has escaped for some time, from the œdema of the coverings of the skull. If necessary, the diagnosis must be made by using the whole hand, after chloroforming the woman, and in this way the required information may generally be obtained.

It is even more difficult to *determine the size and hardness of the head*. As a rule however large children have large skulls, and *vice versa*, a fact which enables us to arrive at an approximate opinion on the subject, by considering the various influences which determine the development of the fœtus, *e.g.* the physique of the parents, particularly of the mother, her age, the number of the pregnancy and its duration (*cf.* § 104); by measuring the length of the fœtus, which is nearly in direct ratio to the size of the skull (*cf.* § 133), and by noting the size of the skull of the parents¹.

More accurate data are furnished by palpation of the head itself between the hands, either merely *per abdomen* or simultaneously *per vaginam* also; by the size of the frontal fontanelle, to which the occipito-frontal circumference is in proportion²; and by the distance between the anterior and posterior fontanelles³. All

¹ *Cf. supra* § 106, and Faabender, *Zeitschrift f. Geb. u. Gynäkologie*, iii., p. 278; Grünbaum, *Berliner Dissertation*, 1879; Stehberger, *Centralblatt f. Gyn.*, 1878, p. 479; Cohnstein, *ibid.*, p. 516.

² *Cf.* Fehling, *Archiv f. Gynäkologie*, vii., p. 507.

³ *Cf.* Mandelsam, *Archiv f. Gynäkologie*, xxi., p. 182.

these factors, together with the hardness of the bones and the width of the sutures, may be obtained (if necessary, by using half or the whole hand), if not with perfect accuracy, yet with such degree of approximation, as to yield a correct conclusion as regards the characters of the skull under consideration. The practitioner will thus be enabled to fill up any gaps in the information yielded by the pelvic measurements, and at a very early period to get a clear idea as to the best line of treatment for him to pursue.

§ 531. I must now try, in a few words, to lay before my reader the principles which by a no means small experience of contracted pelvis has by degrees enabled me first to lay down, and then to verify, and which I can strongly recommend for the guidance of others.

The fundamental points may be embodied in the following statements. *When, and so long as, the spontaneous passage of the head appears to be possible and free from danger, wait. When the condition of the mother forbids any further delay, perforate and extract with the cranioclast, if the head is still high. apply the forceps, if the region of the contraction has been passed, and the child is alive. If the head engages in an unfavourable manner, and does not become fixed within a certain period of time, turn and extract.* Of course these statements do not exhaust all the eventualities, but the experienced practitioner will soon be able to select the proper course in unusual conditions. *The life of the child must always be of little weight in comparison to that of the mother; every operative interference involves very great risk for it, and its prospects are on the whole best, when labour takes its own course.*

§ 532. The following are the two conditions that may be met with:

a. *That in which the head becomes adapted to the pelvis.*

The parturient woman has reached the period of dilatation, the bag of membranes is intact, the skull presents. Here there is nothing to do, except to preserve the membranes entire as long as possible, to forbid all undue straining, to direct the woman to lie in the way that corresponds with the position of the head and of the uterus, to regulate the "pains" as far as may be, and to wait patiently for the end of the first period, or for the rupture of the membranes. When this has arrived, if the cranium engages

in the brim with such segment as is appropriate to the form of pelvis, and if it becomes fixed by good pains, the effect of the latter may be patiently awaited ; but the condition of mother and child, and still more the progressive adaptation of the head to the region of contraction must meanwhile be constantly watched. It is well to direct the woman how, and when, to encourage the pains, how to assist their action by bearing down or by assuming the erect posture for a while ; and to let her lie on the side on which is placed the segment that is about to lead the way ; this is all that can be done. The better the mechanism is adapted to the form of the pelvis, the more may events be left to take their own course.

When the head has passed safely and entirely through the brim, and has got well down into the lower portion of the pelvic cavity, delay may arise from the exhaustion brought on by the prolonged and persistent strong pains, or symptoms may appear, showing that the mother is in danger, or that the fœtus is threatened with asphyxia. Under such circumstances *extraction with the forceps* is indicated, provided that such is the mildest proceeding, and that it promises rapidly to bring about the desired result. Cases of this however are not common ; for pelvises which allow of an easy forceps extraction, rarely oppose an obstacle to the spontaneous termination of labour under the circumstances described. The condition more often accompanies general uniform contraction, but where this latter exists, I would, true to the principle that nothing must be done for an endangered fœtus which involves risk to the mother, only advise a very gentle attempt with the forceps ; and if it is *a priori* clear that the parturient canal will of necessity be severely bruised, I prefer at once resorting to the *perforator*.

§ 533. If however the symptoms which call for the termination of labour, set in, while a large portion of the head still lies in, and above, the brim (although the presenting portion may have traversed the latter), it is best, *if the fœtus has been ascertained to be dead*, not to wait long before *perforating*. But in the opposite case the life of the fœtus must of course be thought of, and since version is no longer admissible under the conditions named, the merits of *extraction with the forceps* must be weighed. Here again, in harmony with the principle that the use of the forceps is only justifiable when "safe", I consider that that

instrument should only be employed in those cases in which it can grasp the whole head, and not only a segment; when the head has, both by its position and by its shape, become adapted to the contracted region, *i.e.* when the contraction is not extreme; when there is reason to think that the maternal parts can still safely be exposed for a short period to a considerable amount of pressure, when therefore they appear as yet not to have been too severely squeezed and contused by the force of the contractions; and when the vitality of the fetus is still entirely uninfluenced by it. If these conditions are not fulfilled, if nothing but injury to the mother can be anticipated from prolonged waiting, *the child must be perforated, even if still alive.*

If the amniotic fluid has escaped very early, the same treatment as has just been recommended, should broadly speaking be pursued, provided that the position of the head &c. is otherwise the same. But in these cases the indications for terminating the labour usually show themselves earlier than where the bag of membranes does not rupture, till the os is more dilated and better prepared. And since the cervix uteri has then generally been already exposed to much severer contusion, since at the time of the operation it is for the most part still within reach of the operating hands and instruments, the forceps is here a much more dangerous instrument, and the attempt to deliver with it requires special precautions. Indeed under these circumstances I do not use them at all, but invariably deliver with the help of perforation.

§ 534. *b. The second condition is that in which the head does not become adapted to the pelvis, but remains movable above the brim, or else is merely pressed firmly upon it. Its causes are an unfavourable position and attitude of the head, an inadequate expelling force or undue contraction of the pelvis.*

With an *unfavourable position and attitude* (presentation of the anterior or posterior parietal bone, extra-median presentation, a position of the head which does not correspond with the shape of the pelvis, face or brow presentation), it is a good plan at first and as long as it can safely be done, to wait and see what effect the pains have in rectifying the abnormality, and enabling the head to progress, everything of course being meanwhile done to improve the position of the fetus and of the uterus by appropriate posture. But as soon as it becomes evident that the head

cannot be spontaneously rectified and fixed, or will probably only be so, when labour has lasted such a time as is inconsistent with the welfare of the mother and even of the fœtus, the presentation should be changed, *i.e.* *podalic version* should be performed, followed by *extraction*. This operation is not under the circumstances a premature interference with the mechanism; on the contrary it improves the presentation, in much the same way as with a cross birth. It is undertaken with the knowledge that without it the child will almost certainly be sacrificed, that if the operation is done, the child will also probably perish, although it has a chance of being saved, while the mother will almost certainly fare better, mainly owing to her labour being shortened. I need hardly add that the necessary conditions for the easy performance of version must be present, that the deformity must not be too great, and that the head must be quite unable to pass into, and through, the brim. If the reverse is the case, it is better to *perforate the presenting head, and extract it with the cranioclast*. For under the circumstances referred to, the mother runs more risk of being injured, if the *after-coming* head is brought down into the brim, and then mutilated and extracted, than she does if the same operation is practised on the presenting head; this is due to the fact that in the former case the occupation of the pelvic canal by the trunk, and the great distance of the bones of the head make it difficult to reach the latter, while moreover a much greater pressure is exerted on the parturient canal by the operating hands and instruments. It is for such cases as these that even my most skilful assistants have been compelled to seek my help; comparatively rarely did they require it, when perforating in head-first labours.

§ 535. If the head is delayed in engaging in the brim, or at any rate does not so engage within a certain limit of time, owing to *insufficiency of pains*, and if it is not found possible to remedy this insufficiency (in seeking to do which however I must strenuously warn the practitioner against introducing any irritants into the uterine cavity, on account of the risk of admitting air and of septic infection), *version and extraction* may also be indicated, provided always that the necessary conditions for their easy performance are present, and that the proceeding holds out the prospect of saving the child. For both the uterus and the fœtus soon begin to suffer, where there is much delay, partly in conse-

quence of the complete escape of liquor amnii, which has generally occurred under such circumstances, partly in consequence of the persistent, even though slight, pressure of the head on the cervix uteri and against the edge of the pelvis. Hence any artificial delivery that is subsequently required, will have to be performed with much worse prospects of success. It is important therefore to operate at the right moment, although this does not imply that it may not be well first of all to see how matters progress, while the attendant remains a passive spectator, and merely gives the usual directions as to posture &c. It is a mistake to base too high expectations on the results of version; individual skill has much to do with the issue, but the latter is admittedly dependent on a great many circumstances. The after-coming head undoubtedly does sometimes pass more easily through the brim than the fore-going, but this fact is always connected with the condition that the contraction is mainly of the nature of flattening, and therefore offers room for moulding of the cranium and for manipulations in a transverse direction; further and chiefly, as Litzmann points out, that the head shall *engage with a flexed chin*, i.e. with the occipito-mental diameter in the axis of propulsion¹ of the pelvis, so that it can be seized by the old French method (Levret), i.e. that vigorous traction can be exerted on the chin and shoulders simultaneously (cf. § 912); only then is it possible to bring the head through sufficiently rapidly to save the fœtus, since it is only then that the volume of the skull can be reduced by a gliding of the bones one over the other, and by a displacement of the cerebro-spinal fluid. If *traction is made on the trunk*, the chin is very apt to become separated from the chest, and the occipito-mental diameter will then lie square on the brim; and even when it is found possible to rectify its position, the child will have already perished in consequence of the loss of time.

Version therefore must never be performed as a prophylactic measure, for instance in order to shorten the duration of labour, but only when it appears preferable to waiting, to probably waiting vainly for adequate contractions, and for the head to adapt itself to the contracted pelvis.

In regard to the method of procedure, I shall merely mention that it must be done under chloroform anæsthesia; that as a general rule both feet should be brought down, the more distant one (upper)

¹ Cf. § 25.

being seized first, this being desirable in view of the projected extraction. The extraction of the trunk must be carried out as slowly as possible, and with the help of external expression, while the head on the contrary is delivered as speedily as possible. If the latter cannot be extricated rapidly, and if the fœtus has died during the efforts at extraction, it is well to allow the woman a period of rest, after which, unless manual extraction has by that time become easier, delivery may be completed with the *cephalothryptor* (§ 943 note), an instrument which is of quite as much use here, as in head-first cases.

§ 536. If it is a *high degree of contraction* that prevents the child from entering the brim, if the child is still alive and the mother continues in good condition, the advisability of performing *Cæsarian section* requires consideration. Only in rare cases will its performance be sanctioned, if the state of affairs is fully explained to the woman; but if she consents, the operation must be at once undertaken. Under other circumstances, *perforation, even that of a living child, is indicated*, indeed it is the only resource left open; postponement is useless, and rapidly increases the risk to the mother. To turn and then to extract is not a good proceeding, since the inevitable mutilation of the after-coming head is more injurious to the mother than that of the fore-going; at most might it be undertaken after perforation of the latter. If however the cranioclast is properly used, the extraction of the perforated presenting head, especially when the face is brought down so as to present, is so simple, so safe, and so little injurious, that version should never be resorted to after craniotomy; it merely involves unnecessary bruising of the maternal parts. The *cephalothryptor* ought not to be used, when the head is high and very movable, since in such a case it is too difficult and too dangerous an instrument to manipulate; not only does it offer no advantages over the cranioclast, but positive disadvantages.

§ 537. *Prolapse of the umbilical cord or of the limbs* does not materially affect the treatment recommended above. Reposition will only succeed where the deformity is moderate, where the head engages fully, and becomes fixed at the time of, or soon after, such reposition; and such success is very rare. This complication therefore either calls for early version or early perforation; if the former is not performed quickly, the fœtus as

a rule soon dies. Version benefits the mother by shortening the duration of labour.

§ 538. The treatment of a *pelvic* or of a *transverse presentation* is not much affected by pelvic contraction. The former however not uncommonly leads to difficulty by the breech blocking up the brim and upper portion of the pelvis, and preventing the practitioner from obtaining an accurate knowledge of the pelvic contraction, although the latter may be so considerable as entirely to preclude the subsequent passage of the head through the brim. It is then necessary to perform an operation, which is one of the most injurious there is for the mother, viz. the mutilation of the after-coming head, while it is still high above the contracted pelvis, and that under circumstances in which, if the situation had been recognised in time, Caesarian section would have been indicated; indeed the latter ought to have been performed with all the less delay, since in the cases under consideration the fetus is probably always large and well developed, and moreover has not been injuriously affected by the protraction of labour¹. Under other circumstances it is always advisable, where the breech presents, in good time to bring down a foot, since in difficult cases of extraction the breech is always an unfavourable part to have to work with.

In a case of *transverse presentation* the question might arise as to whether it should be transformed into a vertex. I strongly disapprove of such a course. Cephalic version is not on the whole a valuable operation; it is generally unsuccessful, while in a case of pelvic contraction, even of a slight degree, it is still less indicated, inasmuch as the principal element of success, viz. the prompt fixation of the head, is absent. In one of my cases, I was, even after cephalic version had succeeded, subsequently driven to resort to podalic version, because the head would not become fixed, and of course such version had to be performed under less favourable conditions. In a second case, the cranium which had been brought down into the brim, led to a brow presentation, and this compelled me to perform, a proceeding which could have been avoided, had podalic version been performed at once.

§ 539. I have not yet spoken of the *induction of artificial*

¹ The case of labour from which the pelvis in fig. 89 has been taken, is an excellent illustration of this.

premature labour and abortion, as means of avoiding the dangers of labour at the full term. I must on this subject refer to the chapter on Operations (*cf.* § 876 *et seq.*) for particulars, merely mentioning here that premature labour is no longer admissible, where the contraction is below 7 cm. (2·75 in.); that with a contraction of between 7 and 8 cm. (2·75 and 3·1 in.) it is always so; but that with a contraction which is above 8 cm. (3·1 in.), it is only so in such cases in which the previous history, the shape of the pelvis and the size of the child (as inferred from various considerations, *cf.* § 530) lead us to suppose that labour will be difficult, or when previous severe injuries associated with labour require that the maternal parts be spared as much as possible. To perform the operation in all cases of moderate deformity, merely because the pelvis is contracted, would be to adopt a proceeding which would not be free from risk either for mother or fœtus, and this with a view of avoiding dangers, which are by no means sure to arise, and which as a matter of fact rarely do so.

Artificial abortion can only come up for consideration in the severest degree of contraction, i.e. the fourth, as a means of avoiding the Cæsarian section, which will afterwards be inevitably required. I only regard it as permissible in such cases in which a successful issue of the latter operation for the mother is on *a priori* grounds improbable.

4. Rare Forms of Contracted Pelvis.

a. The Contracted Infundibuliform Pelvis.

§ 540. This class includes pelves in which the brim is either of normal width, or slightly and generally contracted, but in which the narrowing mainly affects, and gradually increases towards, the outlet. If we exclude kyphotic pelves, few will be left in this class; in other words the true contracted infundibuliform pelvis is rare. I have only a few times had to deliver a child where this deformity was present, and have then done so by perforating¹.

The contraction mainly affects the transverse diameter. The

¹ Fischl's publications (*Prager Med. Wochenschrift*, 1880) seem to show that the infundibuliform pelvis is comparatively common in Prague. As already mentioned, I have very rarely met with it.

lateral walls of the pelvis rapidly converge below, the pubic arch is usually (although not always) narrow, and forms an acute angle as in the male pelvis, which the form we are discussing also resembles in the strength of the bones. But the antero-posterior diameter also is frequently found somewhat shortened, a fact which appears to be associated with the unusually slight inclination of the sacrum which is generally present, a condition which reminds us of kyphotic contraction. The *ætiology* is obscure. A primarily narrow formation of the ala of the sacrum seems to be one cause, while the slight inclination of the sacrum points to the possibility of the development of the pelvis from the infantile to the sexually mature type not having been quite complete; it is further possible that this kind of deformity may result from an attitude of the body, in which the weight of the trunk forces the upper surface of the sacrum downwards and backwards, having been assumed at an early period of life and maintained for some time.

. Where the contraction is slight, the diagnosis will probably only be made, when the head which has hitherto advanced without obstruction, meets with such above, or at, the pelvic outlet, causing the latter to be more accurately examined and measured. A greater degree of contraction will be revealed, when the accoucheur makes a vaginal exploration, by the narrowness of the pubic arch, the slight divergence of the descending ramus of the pubic bones, and the slight distance between the ischial tuberosities. More exact information will be obtained by taking measurements in the way described in § 487, and noting the width of the sacrum (the slight distance between the posterior superior iliac spines).

§ 541. *This pelvis is extremely disastrous to the child, and not free from danger to the mother.* If the contraction is generally distributed all round, the head cannot pass through without being considerably lessened in size; perhaps it may do so more easily, where there is only transverse contraction, and where there is room for accommodation in the antero-posterior diameter. At any rate spontaneous delivery is scarcely possible with a mature fœtus. The mother on the other hand is very apt to be injured by the lower portions of the parturient canal being bruised against the pubic bones; the vagina and urinary passages may in this way be rubbed through (resulting in

sloughing and secondary strictures), and even necrosis of the bones and rupture of the articulations may follow. Extraction with the *forceps* will only succeed, where the contraction is slight. Undue force must never be used, since the fœtus will in any case perish through compression of its skull, while the parturient canal will be seriously contused by such force. If a gentle attempt does not rapidly prove successful (the line of traction must be directed far back, owing to the narrowness of the pubic arch), the head must be *perforated*, and extricated with the *cranioclast*; indeed where the contraction is at all considerable, it is best to resort to the latter method of delivery at once. If the woman is seen during advanced pregnancy, the artificial induction of premature labour should unhesitatingly be recommended.

The *inverted, infundibuliform pelvis* of some authors is a pelvis which is generally contracted at the brim, but normal or even too wide at the outlet. This variety is certainly very rare. (*Cf.* Lange, *Lehrbuch d. Geburtshilfe*, Erlangen, 1868, p. 677; Kilian, *Geburtslehre*, Part ii.

b. The Obliquely Contracted Pelvis.

§ 542. An obliquely or ovally contracted pelvis is one in which only one side is contracted, while the other is of normal, or even excessive, width. This variety might therefore also be called the *unilaterally contracted pelvis*, and thus be distinguished from the accidentally asymmetrical pelvis, in which also one side may be more spacious than the other. The contraction mainly affects an oblique diameter of the pelvis, namely the one which starts from the flattened anterior wall, although of course the flattening also involves the transverse diameter.

All these pelvis are characterised by, and their shape is dependent upon, a diminution in the width of the sacrum, i.e. of its ala, on one side, while in almost all the iliac bone of the defective side is at the same time displaced backwards and upwards upon the sacrum—obliquely distorted pelvis; in a great many the ilio-sacral articulation in question is ankylosed, unilateral synostosis being present—obliquely contracted pelvis of Nägele.

§ 543. The characteristics of, and the changes in, an obliquely contracted pelvis are the following (*cf.* figs. 93 and 94): On the diseased side the ala of the sacrum is atrophied, indeed it

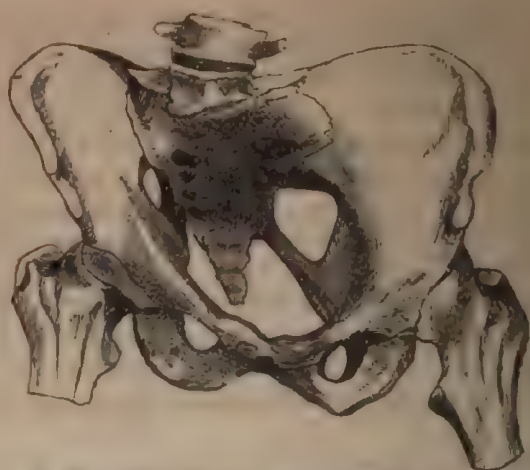


Fig. 93.—Obliquely contracted pelvis of Nægèle. $\frac{1}{4}$ nat. size.



Fig. 94.—Obliquely contracted synostotic pelvis (Breslau Maternity). $\frac{1}{4}$ nat. size.

L. H., *Clinique*, 1865—6, No. 198.

Primipara, æt. 31. Pelvis contracted and distorted on the right side, with simultaneous ilio-sacral ankylosis, due to marked shortening of the right lower limb.

may be entirely absent; the anterior sacral foramina on the same side are smaller than usual, and compressed sideways. If, as generally happens, the sacrum is ankylosed with the iliac bone, the blended surfaces are frequently indicated by a ridge, and are smaller than the corresponding articular surfaces on the opposite side. The upper portion of the sacrum is pushed towards the defective side, and its anterior surface is twisted in the same direction; the lowest lumbar vertebrae are turned in a similar direction.

The os innominatum slopes but little; it is steeper, higher and further back than usual. The ischiadic notch is diminished in size, the ischial spines and tuberosities are approximated to the sacrum. The os innominatum is straighter than usual; its axis runs more directly towards the symphysis; the ilio-pectineal line is on the whole but little curved, although at the point of ilio-sacral union, it forms a more or less sharp angle. The acetabulum looks very much forwards, the symphysis is displaced from the middle line towards the normal side; the pubic bone of the diseased half meets that of the healthy one at a (from side to side) wide angle, and the aperture of the pubic arch is directed towards the flattened side of the pelvis. On the non-affected side, the iliac bone is less steep, and is forced outwards from the symphysis; the inner surface of the iliac fossa looks more forwards, the ilio-pectineal line is in its anterior portion more, in its posterior less, curved than normal.

The obliquity and the distortion appear most marked at the

Artificial premature labour was induced at the 25th week. The child died during delivery, the mother on the 8th day from lymphatic septicæmia. (Cf. Archiv Gynækologie, ii., p. 145).

	Sp. I.....	30.3 cm. (8 in.)
	Cr. I.....	19.6 " (7.6 ")
	C. c.....	16.8 " (6.4 ")
	Dist. Sp. p. s.....	4.6 " (1.75 ")
	Anatomical C. v.....	10 " (3.9 ")
	From the promontory directly forwards to the posterior end of the right horizontal pubic ramus.....	5.5 " (2.1 ")
Bism	Tr.....	9.4 " (3.6 ")
	B. oblique.....	11. " (4.3 ")
	L. ".....	7.9 " (3 ")
	Dist. sacro. cotyl. (right).....	5.2 " (2 ")
	" (left).....	11.2 " (4.4 ")
	Dist. sacro. pectin. (right).....	6.9 " (2.7 ")
	" (left).....	9.8 " (3.8 ")

brim of the pelvis. The oblique diameter which starts from the healthy side of the sacrum, is the shortened one; the other is elongated, their difference being sometimes very considerable. The same is true of the *sacro-cotyloid intervals*; on the diseased side this may be so small that it entirely shuts off the posterior portion of the long oblique diameter from the opening of the brim. The *conjugata vera* is usually unaltered, but occasionally increased; the transverse diameter is always shortened. The distortion may be maintained fairly uniformly throughout the whole pelvis, or may gradually diminish as the pelvic cavity grows wider towards the outlet; at other times a reverse relation may obtain in this direction, the contraction affecting the opposite oblique diameter at the outlet, to that which it did in the brim. This depends on the relative position of the ischial tuberosities.

Ætiology.

§ 541. *The unilateral contraction is mainly due to the abnormally small size of the wing of the sacrum, while the cause of the distortion, which (as already mentioned) is almost always present in these pelves, lies in the persistent pressure, which is exerted by the femora upon the trunk, and which acts mainly on the affected half of the pelvis.* These two factors explain all the irregularities that have been described, while moreover any departures from the typical form may be accounted for by their help, if the special conditions of every individual case are borne in mind. It is obvious that the earlier the time of life at which they come into play, the greater will be the resulting pelvic deformity.

These two factors stand in a relation of reciprocity as regards their causal action; one always provokes the other, but both operate in the same direction. If (a) an undue unilateral pressure is the primarily active agent, the articular surfaces will be displaced one upon the other, while the pressure will lead to atrophy of the neighbouring bony masses and to their sclerosis; in time the pressure and friction cause inflammation of the joint, and this subsequently produces ankylosis. Another instance in which similar synostoses with atrophy of the surrounding tissue may be seen is in the case of the vertebral articulations, when they are exposed to prolonged compression,

as in curvatures of the spine. On the other hand primary unilateral deficiency of the sacrum (*b*) must lead to an unequal distribution of the body-weight, and thus bring about the further consequences of such a condition; possibly too in such cases synostosis may be a result of the pressure and at the same time of the disease of the joint and bones, which primarily led to the atrophy of the sacrum.

The ankylosis of the ilio-sacral articulation must therefore always be looked upon as secondary, where distortion is present; it is also clear that after primary synostosis no distortion of the affected portions upon one another is any longer possible.

§ 545. It is generally speaking difficult to discover how the primary asymmetry of the sacrum, *i.e.* how the primary atrophy of its lateral portion, originated. The atrophy of the wing may be congenital, and arise from a defective development of the ossifying centre which was destined for that wing. It may also originate in earliest childhood, through morbid processes preventing the free development of the lateral portions of the sacrum (rachitis, scoliosis—Hohl). It may further be due to an abnormal union of the transverse process of the last lumbar vertebra with the ala of the sacrum, which union may amount to a blending of the two bones, or merely consist of a cartilaginous connection; in this way the development of the ala, and its outgrowth from the median portion are mechanically hindered (Lambl). Lastly, simple chronic inflammation of the ilio-sacral articulation may cause wasting or atrophic sclerosis of the ends of the neighbouring bones without any resulting ankylosis, and thus lead to asymmetry of the sacrum, as I have shown in the *Archiv f. Gynækologie*, ii., 1871.

Amongst the various causes of the weight of the trunk being thrown on one, or mainly on one, thigh, asymmetry of the sacrum, as already stated, ranks first. With it however must be classed lateral curvatures of the spine, sitting on one side, *i.e.* on one buttock (Thomas), partial or total disuse of one of the lower limbs, and shortening of such limb, while it continues to be used.

If the spinal column deviates to one side, the larger part of the body-weight is thrown upon that side. And the more this is so, the more the sacrum at the same time takes on a scoliotic curvature and is twisted round its axis, the more will the pelvis

be overweighted on that side; and thus is produced a partial atrophy of the ala of the sacrum, and a displacement of the iliac bone upon it. Most of such lumbo-scoliotic pelvises are doubtless *rickety*, but the characteristics of the oblique contraction are often not less distinct than those of the rachitic, and are sometimes even more marked than the latter.

§ 546. The principal cause, which leads to the disuse of one of the lower limbs and to its shortening when again used, is *unilateral hip disease*; next, *loss of the limb by amputation*, *congenital atrophy*, *unilateral dislocation of the femur* upwards and backwards, and *comminuted fracture of the femur*. The various sequelae, the atrophy of the ala of the sacrum, the distortion, and the synostosis are of course more marked, the younger the affected individual, and the more unequally the pressure of the body is thrown on the two thighs. If the limb is entirely useless for the act of progression, or almost so, it will be the healthy side that is overweighted, and in such a case the oblique contraction will be on the side which in other respects presents no pathological changes (*cf.* fig. 95). If however the shortened limb is regularly used, the trunk is inclined to that side during the act of standing, and at every step is thrown with a good deal of force upon it; the oblique contraction then corresponds to the primarily diseased half (as in the case represented in fig. 94). At the same time the latter of course also shows all the alteration which results from the original disease. Thus it may, even if it is not obliquely distorted, still be contracted and too small, since its complete development has been hindered by inflammatory, sclerotic atrophy, and especially by the want of use, and by the wasting of the muscles inserted into it. In such a case the iliac bone is imperfectly developed both in its length and thickness, the transverse pubic ramus and the crista pubis and the ischial tuberosity are atrophied, the limbs of the pubic arch are flattened in the direction of the ischial tuberosity, the latter is displaced in a dorsal direction &c. The oblique contraction is most rarely observed with *unilateral dislocation*, and only when the affected limb did not regain its mobility; the contraction however is not great in such a case. As a rule the limb remains useful, and the pelvis then becomes asymmetrical and oblique, although very rarely distinctly obliquely contracted.

§ 547. We have hitherto spoken of *ankylosis of the ilio-sacral*

articulation, where present, as something unimportant and secondary, and have explained its origin. But there are undoubtedly some oblique pelves, in which we must regard the ankylosis as the primary affection. Even in such however

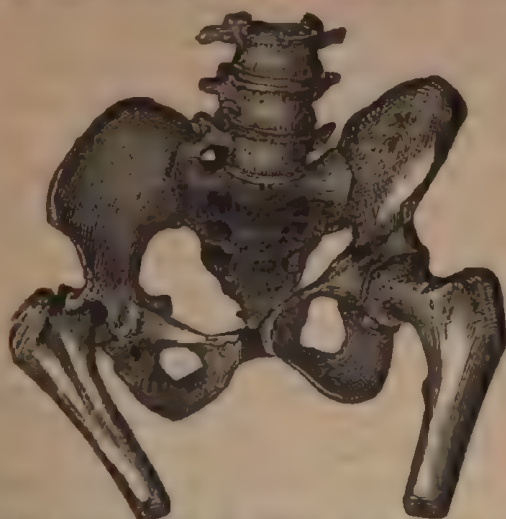


Fig. 35.—Pelvis showing disease of the hip-joint on the right, and contraction and distortion on the left side. (Breslau Maternity¹). $\frac{1}{2}$ nat. size.

¹ E. S., *Clinique*, 1871—72, No. 87.

Suffered when 8 years old from hip disease. After being ill for several years, she recovered, with ankylosis and shortening of the right thigh (on admission the shortening amounted to 7 cm.=2.75 in.). The woman then walked for 4—5 years with a crutch, and did not use the right lower limb. From the age of 16 and onwards, she walked without crutches. Height 143 cm. (4 ft. 8 in.).

Dried pelvis:

Sp. I.....	19.5	cm. (7.6 in.)
Cr. I.....	19	" (7.4 ")
C. e.....	16	" (6.3 ")
C. d.....	11	" (4.3 ")
Anatom. C. v.....	9.75	" (3.8 ")
Brim. { Tr.....	10.5	(4.1 ")
{ r. oblique diam.....	9.75	(3.8 ")
{ l. " "	11.5	" (4.5 ")
Dist. sacro.-cotyl. r.	9	" (3.5 ")
" " " l.....	6	" (2.3 ")
" " -pect. r.....	10.75	" (4.2 ")
" " " l.....	8.75	" (3.4 ")

A sagittal plane passing directly downwards from the middle of the lumbar vertebral column, cuts the left horizontal pubic ramus at its outer extremity, just in front of the acetabulum.

First Labour when 29 years old (*Clinique*, 1866—67, No. 278). Artificial premature labour was induced by Tarnier's method in the 35th week. During delivery of the

the ankylosis is not due to an *original*, i.e. primary, error of development, since the ilio-sacral articulation is formed, before the centres of ossification for the alæ of the sacrum appear (Luschka), and since in all obliquely contracted, ankylosed pelves the alæ of the sacrum already possess a wedgelike shape, and are therefore further developed than obtains in the mature fœtus. *Nor can the osseous union be due to the ossification encroaching prematurely on the ilio-sacral mass of cartilage* (Kiwisch), inasmuch as the ilio-sacral articulation is a true joint, and the progress of ossification ceases at an articular cavity. Otherwise there must have been a congenital absence of the articular fissure, and the ilio-sacral cartilage must have remained uncles (Kehrer), a condition which has hitherto not been observed in man. We seem therefore driven to regard the ankylosis and the obliteration of the articular cavity, as invariably *the result of inflammation*. The latter may have been purulent, and involved the neighbouring parts, and to some extent have destroyed the adjacent bones; but it may also have been restricted to the joint, the resulting adhesion ending simply in ossification. Such a process may date far back, and have run an entirely insidious course, so that the history of the patient throws no light upon it. Similar inflammatory processes are, we know, occasionally seen in company with scrofulous inflammations (both destructive and adhesive) of the joints and the bones of the lower extremities; they may doubtless also rise from a slight injury, e.g. a bruise.

trunk the second breech position was converted into the first; the trunk passed out in the first breech position, the transverse diameter of the trunk lying in the left oblique diameter. The head engaged in a transverse direction; manual extraction was used after it had been brought into the left oblique diameter. The child was born in a state of asphyxia, and was not resuscitated.

Second labour (*Clinique*, 1868—69, No. 159) 19 months after the first. *Artificial premature labour* was induced according to Tarnier's method in the 34th week. Second vertex position, prolapse of the hand, foot and cord within the bag of membranes. Version and extraction were performed, the exit taking place in the second podalic position, the head being born in the second position. The asphyxiated child was resuscitated, and left the hospital with its mother, although in a very feeble condition.

Third labour (*Clinique*, 1871—72, No. 87) 2 years and 9 months after the second. *Artificial premature labour* was induced by warm vaginal irrigations (douche). Second vertex position, delivery occurring without deviations from the usual mechanism. The child was slightly asphyxiated, but recovered for the time, dying however on the third day. The mother died on the seventh day from lymphatic septicæmia (endometritis, parametritis lymphatica, peritonitis).

If the ankylosis occurs at a very early period, it must interfere with the growth of the bones that are adjacent to the joint, and in this instance especially with the wing of the sacrum, which is far less developed than the iliac bone. For the changes in the sacral epiphysis which follow on the ankylosis, must have a great influence on the nutrition of the bone, and inasmuch as new bony substance can only be deposited between an epi- and diaphysis, if these are separated from each other, we cannot here conceive of any further growth taking place, since the separation is prevented by the ankylosis. In the cases in which the osseous union only occurs after the growth of the two bones has terminated, we usually find that no atrophy has resulted, or if it has, then only to a limited extent. Under such circumstances we must suppose that the fully developed bone has undergone atrophy, such as is so frequently and strikingly seen in tubular bones.

A primarily and unilaterally ankylased pelvis therefore cannot, as already stated, be distorted (verschoben); the rare exceptions to this statement which have been recorded, require further investigation and elucidation. But of course such a pelvis may be an oblique (schräg) one; this is proved by the oblique pelves which are found in fetal skeletons and in quite young children, in whom the weight of the body cannot have been thrown more on one thigh than on the other. The atrophy of the wing of the sacrum which is produced by the synostosis, hinders the full expansion of the iliac bones, the ilio-pectineal line is unduly straight, the whole dimensions of the pelvis are contracted and so on, and this makes the pelvis oblique.

Diagnosis.

§ 548. It is not difficult to diagnose an obliquely contracted pelvis, for the affected woman generally either presents a deformity of the lower half of the body, or else shows signs of previous inflammation in, and around, the pelvis; frequently she limps. Further, even if her body appears at first sight to be well formed, the pelvic examination, which should be made in every pregnant and parturient woman, at once reveals the asymmetrical condition of the two sides. A little care must therefore give rise to the suspicion that the pelvis is obliquely contracted. *External*

measurements will show that the iliac bone on one side is steeper and higher than usual, that it projects too far back and is too little expanded (*gewölbt*) ; that consequently the anterior superior spines do not lie in the same plane, that the crest rises higher on one side than on the other, that the posterior superior spines are unequally removed from the middle line, and that one projects further backwards than does the other. The *internal measurements* will show that the pubic arch is directed somewhat to one side (instead of straight forwards), that one horizontal pubic ramus does not bulge sufficiently forwards, that the corresponding ilio-pectineal line is more or less straightened, while the promontory can only be reached with difficulty, if at all ; when it can, it appears to deviate from the middle line, and not to face the symphysis.

§ 549. These facts establish the diagnosis, and the examination may then be completed by taking the measurements recommended by Nægele for this purpose, and by introducing half or the whole hand into the pelvis. The measurements which are equal on both sides in a normal pelvis, but different in an obliquely contracted one, are :

(a) The distance from the ischial tuberosity on one side to the posterior superior iliac spine of the other (the shortest starts from the contracted side) ;

(b) The distance from the spinous process of the last lumbar vertebra to the anterior superior iliac spine (that on the contracted side is here also the shortest) ;

(c) The distance from the anterior superior iliac spine of one side to the posterior superior of the other (the distance from the anterior spine of the contracted side is the shorter) ;

(d) The distance from the lower edge of the symphysis to the posterior superior iliac spine (that on the contracted side is the greater) ;

(e) That from the trochanter major of one side to the posterior superior iliac spine of the other.

I cannot say that these measurements add much to the information, which will have been obtained by the procedure given above. A slight degree of distortion will not be indicated at all by them, and in the case of other diseases of the bones and of their soft parts these measurements for detecting the degree of distortion may lead to serious errors. On the other hand great

differences give an approximately correct idea of the degree of the distortion, and therefore also of the degree of contraction. But the best way of all of arriving at the latter is to introduce the hand into the vagina; for this method, more clearly than any other, reveals the original width of the pelvis and the unilateral flattening; the latter especially will be determined, if the distance of the lower end of the sacrum from the ischial spines, and the length of the two sacro-cotyloid intervals are noted.

Clinically, it matters not whether the ilio-sacral synchondrosis in question is, or is not, ankylosed. But the presence of such a condition may always be suspected, if there are distinct signs of previous inflammation, and if the unilateral contraction and flattening are very marked. To my mind it is very doubtful whether it would be possible (at any rate in every case) by examining *per rectum* a person in whom no ankylosis is present, to detect a displacement at the ilio-sacral articulation, when the woman is made to stand alternately on each leg¹; the attempts I have made with this object on a healthy pelvis, did not enable me to discover such displacement.

Course of Labour.

§ 550. The course of labour depends mainly on the original width of the pelvis, and only to a secondary extent on the degree of the distortion. The long oblique diameter can only be used, where the flattening and the deviation of the promontory are but slight, and then the sagittal suture of the head generally lies in that diameter. If however the sacro-cotyloid interval is very small, the portion of the long oblique diameter which lies behind it, is entirely wasted, as far as the mechanism of labour is concerned; indeed the anatomically shortest oblique diameter may clinically be the longest. In such a case the form of the pelvis approximates to the generally contracted, and the mechanism of labour is also similar. The head enters the brim with the occiput depressed, this being sometimes (and comparatively often) directed towards the contracted, sometimes towards the wide side, an unimportant matter as far as the result is concerned; the sagittal suture runs obliquely or transversely.

The further progress depends, as in the generally contracted

¹ Freund, *Archiv f. Gynakologie*, lii., p. 399.

pelvis, on the amount of contraction, and on whether the latter increases or diminishes towards the outlet. These relations determine whether labour will end comparatively easily and spontaneously, or whether natural delivery will be impossible.

The above remarks will show that there is no special time for the extension of the head to take place; but the practitioner who is familiar with the mechanism, will easily be able to explain the phenomena in any particular case. I may mention however that the exit of the head is usually easiest, when the sagittal suture corresponds with the anatomically shorter oblique diameter of the brim, probably because in a good many cases the contraction decreases towards the outlet, and the obliquity is more or less reversed. On the other hand an after-coming head passes most easily, when its occiput is directed towards the wide side of the pelvis.

Prognosis and Treatment.

§ 551. The *prognosis* of labour with an oblique pelvis depends upon the same conditions as hold in the generally contracted, and especially in the generally contracted and flat pelvis; but it varies with the degree of the deformity and with the mouldability of the head. Litzmann's statistics (out of 28 mothers, 22 died during their first confinement; out of 41 labours only 6 passed off spontaneously, 5 of them being in the same individual; out of 41 children only 10 were born alive, and of these 6 had the same mother) as well as those of S. Thomas, which yield similar results, would seem to show that the prognosis is extremely unfavourable. But the state of affairs is scarcely so bad in reality. The above melancholy results only accompany the worst forms of contraction and distortion; in the slighter cases results are doubtless far better, although rarely published.

§ 552. Nor does the *treatment* of labour in an oblique pelvis call for any special remarks. It is obvious that artificial premature labour is indicated, even in primiparae, wherever there is considerable unilateral flattening and contraction. During actual labour the practitioner should begin by watching the course of events, and adapt his treatment to the existing conditions. But I must warn him against *applying the forceps*, if the obstruction is at all considerable; I only recommend that instrument here, as in other cases, when the head is low, and the pelvic outlet

normal. I must likewise caution him against *turning*; for the hope that the after-coming head can be brought into the best position, and will then be more easy to extract, is very delusive. The best treatment is, as already mentioned, first of all to wait, and if difficulty arises, soon to proceed to *perforation*. Lastly, Cæsarian section may be required in this form of pelvis, as in any other case, when delivery *per vias naturales* is impossible.

c. *The Transversely Contracted Pelvis.*

This pelvis is exceedingly rare, and our knowledge concerning it is still recent. Two forms are met with, differing entirely as regards their mode of origin and their conformation: (1) the bilaterally synostotic, and (2) the kyphotic, transversely contracted pelvis.

(1) *The Bilaterally Synostotic, the Transversely Contracted Ankylosed, or Robert's Pelvis.*

§ 553. This pelvis was first described by Robert (fig. 96), and is characterised by the small size of the sacrum, due especially to the absence of lateral masses, and by the ankylosis of the two ilio-sacral articulations. The sacrum is not much broader above than below and resembles an elongated quadrangle; the horizontal concavity has disappeared except at the last vertebra, while the vertical is either very slight or absent; the anterior sacral foramina are small, and contracted from side to side. The



Fig. 96.—The transversely contracted pelvis of Robert. $\frac{1}{4}$ nat. size.

whole bone has sunk deeply and far forwards between the iliac bones, the latter projecting considerably beyond it in a backward direction; moreover the iliac bones take a straight course forwards, so that the pubic bones meet at an acute angle. The ischial bones are very much approximated, the spines being but little removed from the sides of the sacrum.

These conditions cause extreme narrowing of the transverse diameters. The antero-posterior are but little, if at all, affected, for although the position of the sacrum would tend to shorten them, this is compensated for by the absence of the normal outward curvature of the pelvic ring. In the majority of pelvis the malformation is different on the two sides, leading to some degree of asymmetry. The brim has usually the form of a long narrow quadrangle, which in extreme cases becomes more or less wedge-shaped, the base being directed backwards. The contraction increases towards the outlet, while the whole canal is at the same time somewhat deepened, and resembles the pelvis of several of the lower animals.

§ 554. Apart from a few congenital cases¹, only 8 well marked examples of this pelvis are known: that first described by Robert in 1842 (now in Würzburg), one by Kirchhoffer (in Kiel), one by Seyfert and Lambl (Prague), one discovered by Dubois and described by Robert, and one each by Lloyd Roberts (*London Obst. Trans.*, ix.), Kehlerer, A. Martin (Berlin, *Dissertation*, 1870), and Kleinwächter.

The pelvis described by Schatz in *Archiv f. Gyn.*, i., is unilaterally flattened, if we may judge from the accompanying figure. As regards Grenser's case (Leipzig, *Dissertation*, 1866) it is doubtful whether it belongs here; but probably it does, since there was necrosis of the right ischial bone lasting for years. Comelli (*Annal. Univ. di Med. e. Chir.*, July, 1875) and lately Sanger (*Deutsche Med. Wochenschrift*, 1880, p. 134) have each described a pelvis which became transversely contracted as a consequence of early inflammation of both knee- and hip-joints, and probably also of the ilio-sacral articulations.

§ 555. This variety of deformed pelvis is in the majority of cases caused by a primary, congenital smallness of the sacral wings, which either through accessory inflammation of the ilio-sacral joints (after their full development) led to their ankylosis, or which is from the very first associated with defective development of these joints, and with resulting synostosis of the bones concerned. In other instances (and to this class undoubtedly belong the second pelvis of Robert and that of Kleinwächter), the sacrum must have been originally of normal width, but have become diminished through destructive inflam-

¹ Cf. Nægels-Grenser *Lehrbuch*, 8th ed., 1872, p. 522.

mation, and ankylosed with the iliac bones. In yet other cases (and their mode of development is very similar to that just mentioned), the ilio-sacral ankylosis, which has resulted from inflammation before the completion of the growth of the pelvis, may lead to the arrest of the growth of the wings of the sacrum, and thus to their remaining permanently of small size (Comelli, Sanger).

The *diagnosis* will rest on the generally diminutive size of the great pelvis, on the shortening of the Sp. I. and Cr. I. and of the width across the trochanters, on the undiminished length of the C. e., as well as on the circumstance that the postero-superior iliac spines are very close together, and almost cover the spinous process of the last lumbar vertebra, and that the nates are in contact for a long way up. The internal examination reveals the shortness of the transverse diameter, the almost parallel direction of the rami of the pubes, and the straight course of the ilio-pectineal lines. An accurate measurement of the outlet, and the introduction of half the hand will determine the degree of contraction. The history of the patient and the general appearance of the pelvis will prevent its being confused with a tri-radiate or a kyphotic pelvis.

The *prognosis* is bad. Out of the women in whom the 8 pelves quoted above occurred, 6 were delivered by Cæsarian section, 2 (Seyfert and Kleinwächter) by perforation; one of the latter two died during the post-partum period, the other (Kleinwachter) was able to be discharged, but nevertheless died from the consequences of puerperal disease. These pelves therefore almost always make natural delivery impossible; the transverse diameter of the outlet usually does not amount to more than 5 cm. (2 in.) and has been less! (In the cases of Schatz, Grenser and Comelli, perforation was resorted to, and the women were saved; indeed the first one recovered in spite of rupture of the uterus; Sanger has extracted a child successfully with the forceps, but the contraction at the brim was only slight, while the interval between the ischial tuberosities measured 7—8 cm. = 2.75—3.15 in.)

(2) *The Kyphotic Pelvis.*

§ 556. The transverse contraction which characterizes the kyphotic pelvis (fig. 97), is due to an alteration of the direction in which the weight of the superimposed trunk acts upon the upper end of the sacrum. That contraction must therefore be less

marked, the higher the kyphosis; indeed when the latter is dorsal, there may be no contraction at all, provided the kyphosis is compensated for by a sufficient lumbar lordosis. Conversely, the transverse narrowing is greatest, where the kyphosis is situated in the lumbar and lumbo-sacral regions, and especially when it has been caused by caries occurring at an early period of life. In kyphosis due to rickets, the effects of the former are less marked than those of the rickets.

The weight of the body which acts in the direction of the upper longer limb of the kyphotic curve, forces the hump itself further backwards, and the lower limb of the curve soon follows



Fig. 97.—The Zürich (Moor's) kyphotic pelvis. Somewhat above a $\frac{1}{2}$ nat. size.

suit. As a result of this alteration in the vertical pressure, the sacrum is driven more deeply than normal between the iliac bones, while its upper portion is rotated backwards (round an axis running in the direction of its greatest width), owing to the traction which is exerted by the lower limb of the curve. A recession of the lower end of the trunk however is necessarily accompanied by a displacement of the line of gravity backwards, *i.e.* behind the line of support which passes horizontally through the acetabula; consequently the anterior pelvic wall must coincidentally be raised, and the pelvic inclination diminished. Lastly, the rotation of the pelvic ring backwards is resisted by the ilio-femoral ligaments, which are rendered very tense.

The following alterations in the form of the pelvis are produced by these factors :

§ 557. The upper half of the *sacrum* is rotated backwards and outwards, the lower forwards and inwards ; as a result of this the bodies of the upper sacral vertebrae recede somewhat in relation to the *ala*, causing the anterior surface of the bone to become strongly concave in a transverse direction. On the other hand the longitudinal concavity as well as the width of the sacrum are diminished, owing to the upper end of the bone being dragged upon ; while the lower end of the sacrum is less bent forwards than usual, in consequence of the little tension there is on the ligaments that are inserted into it. The *ilio-pectineal line* is drawn upwards towards the receding promontory, the upper sacral foramina look obliquely upwards. Owing to the rotation of the whole sacrum, the sagittal diameter of the brim is elongated, those of the cavity and outlet shortened. Looked at from behind, the first spinous process of the sacrum appears inclined downwards, and the elevation of the sacrum diminished.

The *iliac bones* rotate round an axis which may be supposed to run from below and inwards, upwards and outwards, passing through the hip-joints at right angles to the line of traction of the ilio-femoral ligaments. The result of this rotation is that (in consequence of the resistance which these ligaments offer to the backward pull exerted by the sacrum) the upper portion of the iliac bones moves outwards and forwards, the lower inwards and backwards. Hence the increase in the transverse diameter of the great pelvis, and the decrease in the cavity and especially in the outlet of the small pelvis. The *iliac bones* are therefore more horizontal than normal, the *dist. Sp. I.* and *Cr. I.* are increased, the S-shaped curve of the iliac crests is diminished, the posterior superior iliac spines are approximated to each other, the ilio-pectineal line is straighter than usual (*cf. also supra*). The portions lying below the anterior superior iliac spines, *i.e.* the anterior inferior iliac spines, as well as the parts above the edges of the acetabula are strongly developed, owing to the constant action of the ilio-femoral ligaments which are inserted there. The *ischial tuberosities* and the *ischial spines* approach one another, the *pubic arch* is narrowed ; owing to the increased pressure of the heads of the femora inwards, the horizontal *rami of the pubes* take a straighter course forwards, so

that they meet at the symphysis at a more acute angle than usual; the symphysis advances further, the anterior portions of its two articular surfaces gap, the ovoid form of the brim becomes pointed in front. In the sitting posture, the trunk rests on the most anterior portions of the ischial tuberosities, and on their ascending rami. In consequence of this and owing to the rotation at the hip-joints which has been referred to, the ischial tuberosities are forced yet further backwards and also inwards; they grow rounder and narrower. The ascending ischial rami on the other hand are somewhat thickened, and their edges everted. The pressure upon them forces the rami of the pubes upwards, contracts the pubic arch, and assists in raising the symphysis.

Thus the *small pelvis* comes to have unusually high sides. At the brim the C. v. and the oblique diameters are increased; the transverse is diminished, and frequently smaller than the antero-posterior. Lower down the antero-posterior diameters diminish a little, the transverse do so decidedly more; the diminution is most marked towards the outlet.

§ 558. When the *kyphosis*, i.e. the inferior limb of the kyphotic curve, *reaches very low* down, to the sacrum, the weight of the trunk acts directly upon the latter from forwards and upwards backwards and downwards. In such a case the anterior surface of the sacrum is not elongated, but shortened and narrowed; there is no true promontory. But the alterations of the pelvis which have just been described, will be particularly well marked under such circumstances. The great mobility in the pelvic articulations which is sometimes met with, results from the extensive rotation of the sacrum round its transverse axis.

Lastly, if the kyphosis is *as low as it is possible* for it to be, the lumbar vertebral column may present so very marked a lordosis, that it roofs in the brim of the pelvis, much as in spondylolisthesis (*pelvis oblecta*), and causes an enormous shortening of the distance between the symphysis and the lumbar vertebra which has approached nearest to it. The cases of this kind have been collected¹ by Fehling and Hergott (*l. c.*).

¹ Hergott has introduced the name *spondylolistema* for this subvariety of kyphotic pelvis, i.e. for the cases of *pelvis oblecta* which are caused by the vertebral column sinking in through destruction of the bodies of the vertebrae. These cases must not be confused with *spondylolisthesis*, where the vertebral column has slipped from the sacrum (*cf. infra*), owing to the imperfect articular processes.

(To this class belongs the pelvis described by Stadfeldt in a Danish *Zeitschrift* of 1868, and which is reproduced in fig. 38.)

§ 559. The *diagnostic* indications of the kyphotic, transversely contracted pelvis are the previous history, growth and attitude of the patient (the inclination of the upper part of the trunk forwards, and the forward position of the thighs), the discovery of the actual kyphosis, and especially that of its situation. The following points will distinguish it from other pelvises, more particularly from the osteo-malacic: the great distance between the Sp. I., the slight interval between the posterior superior spines, the horizontality of the iliac æle, the prominence and

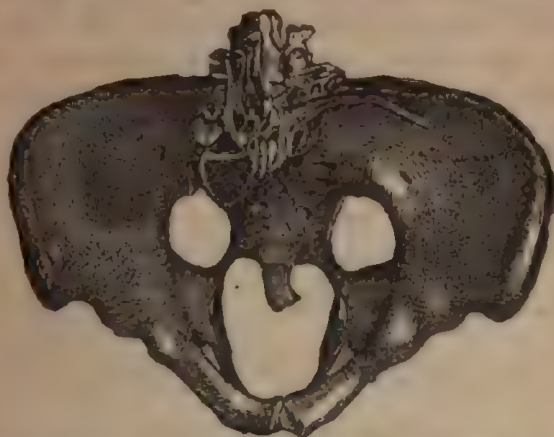


Fig. 38.—Stadfeldt's kyphotic and roofed-in pelvis (*pelvis oblecta*). $\frac{1}{2}$ nat. size.

height of the symphysis; the difficulty of reaching the promontory; the length of the C. e.; the position and form of the sacrum; the shallowness and flatness of the pelvic floor, the slight distance between the ischial spines and ischial tuberosities, and the narrowness of the pubic arch. The enlargement of the pelvic outlet during labour, due to the mobility of the pelvic joints, is quite different from that met with in the osteo-malacic pelvis, where it is often caused by the softness of the bones themselves.

§ 560. The *difficulties of labour* depend of course on the degree of contraction; the possibility of enlarging the outlet, which has just been referred to, will rarely help much. In but few cases is the diminution of the pelvic cavity so great as to

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require Cæsarian section (it was so however in the case recorded by Martin, *Zeitschrift f. Geb. u. Frauenk.*, i., 1875, p. 339). The fœtus lies comparatively frequently in a dorso-posterior position, doubtless owing to the usually marked pendulous abdomen, to the limited intra-abdominal space, and to the lordosis of the upper limb of the spinal curvature, these factors causing the body of the fœtus to lie with its flexor surface looking forwards. The head therefore is also frequently placed in an abnormal position.

In cases where the outlet is very unusually narrow, Cæsarian section may be indicated; but as a rule the best plan is not to interfere with labour in a kyphotic pelvis. An attempt to extract with the forceps may be made, if really necessary, but should the difficulties be at all considerable, the better course is to perforate, and if the difficulties are foreseen from the very first, to perforate at once. Version does not offer much prospect of benefit to the child, so that the unnecessary irritation of the genital canal that is associated with it, should be avoided. That operation is only permissible, where its immediate performance is demanded by an abnormal presentation, or by a position which prevents the fœtus from entering the pelvis, and where there is still a prospect of saving the child, or where immediate perforation appears more difficult and injurious than the perforation of the after-coming head which may be necessary. Artificial premature labour is justified in most of these cases.

d. The Tri-radiate Pelvis.

This variety includes the pelves, in which the promontory and both acetabula are simultaneously pushed in towards the pelvic canal. It can only be formed, when the bones are extremely yielding, a condition which is almost invariably due to osteomalacia; in very rare cases to rickets.

(1) The Osteo-malacic Pelvis.

§ 561. Osteo-malacia is due to a morbid process starting in the Haversian canals, which deprives the bones of their calcareous matter, to a disappearance of the fat-containing medulla, and to the softened tissues being replaced by hypertrophic young medulla; possibly it may be a form of osteitis or osteo-myelitis, which progresses from within outwards. The bones are some-

times slightly enlarged; in the fresh condition the periosteum and medulla of the bones are very hyperæmic; the latter is dark, reddish-blue, or brown, soft and rich in fat, the capillaries are greatly distended and widened. Since the substitution of medulla for bone follows the course of the Haversian canals, complete bony lamellæ are often still found surrounded by medulla, the surface of the section resembling diploë.

(If the cortex retains a certain thickness, the bones are liable to be sharply bent and fractured, and as a rule do not recover completely from these injuries [fragile variety—Kilian]. But if even the cortex disappears, or does so with the exception of an extremely thin lamella, the bones become curved, compressed and shortened, and may be stretched without breaking [they may be as soft as wax, flexible variety—Kilian; *india-rubber* or *caoutchouc* pelvis]. During labour however almost all osteo-malacic pelvis, in which the disease has not yet become arrested, can be stretched; *cf. infra*.)

Osteo-malacia is mainly a disease of females, and its occurrence in them is associated with the sexual function, and usually with the puerperal state. In rare cases it may show itself in a first, but more often does so in a subsequent, pregnancy. Its severity is undoubtedly increased by the fact that in the gravid state the foetal skeleton is being built up at the expense of the mother, and further aggravated during lactation owing to the loss of lime through the milk. Each subsequent puerperal period is usually associated with an increase of the morbid process, but occasionally the disease is arrested, especially if there is a long interval in child-bearing; it is extremely rare for complete recovery to take place, or for the pelvis again to become ossified (*cf. Winckel, Monatsschrift f. Geburtsh.,* xxiii., p. 81).

The proximate exciting causes of the disease are obscure. A cold and damp dwelling, want of air and light, unsuitable nourishment have been accused; but endemic influences appear to be of greatest importance, and only when these are present can the former causes prove effectual. The way in which isolated districts are attacked (*e.g.* the neighbourhood of the Rhine, East Flanders, the lowlands round Milan—*cf. Casati, Obst. Transactions of London,* xiii., p. 244), while others are quite free, is very remarkable. Here I have only seen one osteo-malacic puerperal woman, although the above-mentioned ætiological influences are present in abundance. But there can be no doubt that if the general requirements for the development of the

disease are present, the puerperium with its lowering tendencies may readily provoke the outbreak.

Osteo-malacia generally involves mature bones, rarely those that are not yet fully formed. It may involve all the bones, reducing the body in an extreme case to an unsightly, horribly distorted, collapsed mass of flesh (*cf.* the figure in *Medico-Chir. Transactions*, xxvii., Plate 6), or be restricted to localised areas; the vertebræ and the long tubular bones are most frequently involved, the cranial bones most rarely. In the puerperal state it is mainly the vertebral column and the pelvis that suffer, probably owing to the increased supply of blood to the latter; not infrequently the disease is confined to these parts.

§ 562. The alterations in form, which the pelvis experiences (figs. 99 and 100) where the bones are soft, depend on the pressure relations (these varying with the attitude of the body) and on the action of the muscles; the extent of these alterations depends upon the degree to which the bones yield, and upon whether they are simultaneously or successively involved. In the erect posture, the posterior pelvic wall is driven downwards, the anterior upwards; the lateral portions are driven in a direction similar to that of the necks of the femora, viz. obliquely inwards, while the region of the symphysis is at the same time driven forwards. In the sitting posture, the ischial tuberosities and the lower portion of the sacrum are driven in towards the pelvic cavity, the curvature of the sacrum being increased in consequence. In the lateral posture, the iliac bone is pressed inwards, the whole cavity of the pelvis being narrowed transversely. In the recumbent position, the sacrum is pushed forwards, the iliac bones are compressed from behind forwards, sometimes so much so as merely to leave a narrow chink.

The osteo-malacic pelvis therefore presents the following characters:

The *sacrum* is driven far in between the iliac bones and is narrow, especially as regards its ale; the promontory is very low, on a level with the symphysis, or even lower than its upper edge. The vertebral column has, like the promontory, sunk more or less into the pelvis and forwards over it, so that it may cover the brim like a roof. At the same time the sacrum is strongly curved, the upper portion is almost horizontal, the

lower is bent forwards at an acute angle ; flexion often begins as high as the second vertebra.

The *iliac bones* are usually steep, but in this respect considerable differences occur on the two sides, one fossa sometimes lying vertically, the other quite horizontally. They may be



Fig. 89.—Osteo-malacic pelvis at an early stage of the disease. $\frac{1}{2}$ nat. size.



Fig. 100.—Osteo-malacic pelvis in the Pathological Museum of Göttingen, distorted in the highest degree (as soft as wax). $\frac{1}{2}$ nat. size.

rolled together in an antero-posterior direction, sometimes also from above downwards ; the posterior superior spines are approximated towards the spinous process of the last lumbar vertebra, the dist. Sp. I. is shortened, the dist. Cr. I. usually long.

The *acetabular region* on either side projects into the pelvic cavity, and in the severest forms may do so to such an extent, that the floors of the acetabula may be in contact with the promontory. The *pubic bones* are at the same time driven inwards, and sometimes approach so near to one another, that here and there nothing but a narrow cleft remains between them. Further, the great approximation of the *ischial tuberosities* may entirely obliterate the *pubic arch* in extreme cases, and, since the ischial tuberosities are also somewhat everted, give it the shape of an omega. I need hardly add that the symphysis may often be displaced to one side, that the whole pelvis may be very asymmetrical, and present numerous deep indentations.

The above remarks will show that it is at the outlet of the pelvis that the greatest contraction will occur, and that region is as a rule affected at an earlier period than is the brim. In the minor degrees of the deformity, the brim and the cavity are triangular, but afterwards this triangle becomes converted into a three-pointed figure, owing to its sides being pressed in; finally it forms a tri-radiate, Y-shaped cleft. The transverse diameters are always shortened, and become increasingly so below. The sagittal diameters vary, but even if they are not shortened within the cavity itself, they are made useless by the apex of the sacrum being reflected inwards and upwards. This latter condition, combined with the approximation of the rami of the pubic arch and of the ischial tuberosities, reduces the pelvic outlet to very small dimensions.

§ 569. Where the pelvic deformity is well marked, i.e. in the severer cases, *diagnosis* is easy; the previous history of the patient and the changes we have mentioned, will clear it up. The degree of the contraction is best ascertained by introducing the whole hand into the vagina, after chloroforming the woman. It is also very important at an early period to ascertain *whether the pelvic bones are at all yielding*. This condition is much commoner than was formerly supposed; Litzmann (in 1857) estimated its frequency at $15 : 85 = 17$ p. c., while 15 years later Hugenberger was able to state it at $32 : 110 = 30$ p. c. Its importance moreover is made evident by the fact that Litzmann up to 1857 estimated that 40 Cæsarian sections had been performed in 85 cases of osteo-malacia= $\text{ca. } 50$ p. c., while in

cases that have occurred subsequently to 1858, Hugenberger discovered only 4 operations recorded out of 25 cases=16 p. c.; in a total of 32 dilatable pelves only 7 Cæsarian sections have been performed. Casati asserts that he has almost always found the osteo-malacic pelvis (which is so common in Milan) to be dilatable, and has extremely rarely been obliged to resort to Cæsarian section (only in 2 out of 41 cases). This experience will probably be found generally true; indeed the results of the cases that have more recently been published prove it; the history almost always states that the pelvis was yielding. At any rate, pelves in which the osteo-malacic process is still in progress, appear almost without exception to be dilatable.

The softness may be very slight during pregnancy, although usually greater than before conception; it first becomes distinct during labour, owing to the engorged state of the pelvic veins which is associated with the latter. The onset of the disease may be early recognised, by the great sensitiveness to pressure of the anterior pelvic wall, especially of the symphysis, which is due to the irritation of the nerves caused by the engorgement of the tissues; and before long it will be possible to make sure of the degree of dilatability, by making attempts at dilatation, if necessary, under an anæsthetic. Further, the softness is always most marked at the outlet; it may be absent at the brim, and hence no safe conclusion as regards the latter can be drawn from the softness of the former.

The onset of osteo-malacic pelvic deformity can only be overlooked by a superficial observer. The history of the patient, the whole character of the body, and the measurement of the pelvis, which should never be omitted, will prevent mistake.

§ 564. This is not the place to discuss the prognosis, course and treatment of malacosteon. Its *obstetrical importance* however has been clearly shown by the previous description, and now that we have better proof that most of such pelves are dilatable, spontaneous labours, at any rate *labour per vias naturales*, have become more common. Nevertheless Cæsarian section is still imperatively called for in by no means a small number of cases, and if not, some other difficult operation is generally required. Even in the 32 cases of dilatable pelvis collected by Hugenberger, operations (1 symphysectomy and 7

Cæsarian sections) were performed in 8 (=25 p. c.) with the following results :—

Mortality for the mothers.....	75 p. c.
„ children.....	50 p. c.
Other modes of artificial delivery were used in 16 cases=50 p. c.	
Mortality for the mothers.....	6·3 p. c.
„ children.....	37·5 p. c.
8 labours ended spontaneously=25 p. c.	
Mortality for the mothers.....	12·5 p. c.
„ children.....	37·5 p. c.

These results of labour in the flexible pelvis show how bad the obstetrical prognosis generally is, where there is osteo-malacic deformity.

Where the pelvic deformity is of moderate degree, and the bones are soft, *treatment* during pregnancy will involve the question of artificial premature labour; or where there is extreme narrowing of the brim, artificial abortion must be considered. The proper procedure during a labour at the full time depends on the roominess and softness of the pelvis. Where the bones are yielding, it is best to wait as long as can safely be done without fear of rupture. But of course all the circumstances of every individual case must be most carefully investigated, and treatment regulated accordingly.

(2) *The Tri-radiate Rachitic Pelvis.*

§ 565. Two varieties of this pelvis are met with. The first includes rachitic pelves, in which the fully formed bones have subsequently been attacked by osteo-malacia, as a result of which the bones which had previously undergone ossification, become secondarily softened. The entire pelvis is then converted into a yielding mass in the same manner as in malacosteon, and, being exposed to similar mechanical conditions, undergoes analogous distortion; in other words rickets and osteo-malacia are combined. (*Cf. inter alios* Pagenstecher, *Monatsschrift f. Geburtskunde*, iv., p. 1; fig. 101 also shows such a pelvis.)

The second variety includes pelves which, although purely rickety, have become considerably softened, and have therefore yielded under the force exerted by the body-weight and thighs,

these factors causing it to assume the shape which is characteristic of osteo-malacia—*pseudo-osteo-malacic pelvis* (Michaelis). Such softening occurs now and again in cases of severe and prolonged rickets, where osteoid layers are deposited on the fully formed bones, this process being followed by a gradual resorption of the latter. But such a pelvis may always be distinguished in the adult from the osteo-malacic, by the firmness and

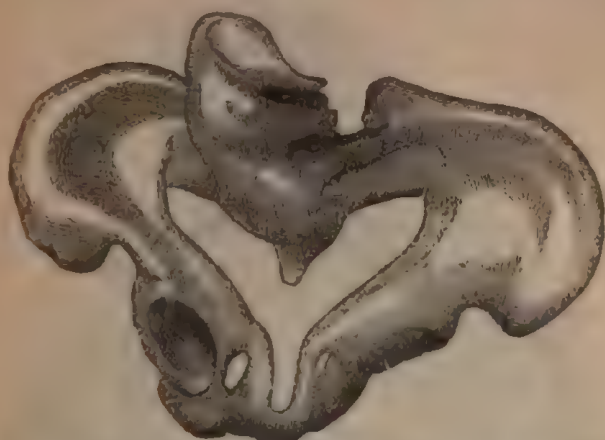


Fig. 101.—A rachitic pelvis which, after 5 normal labours, was attacked by osteo-malacia. (According to Zoja in *Ann. univ. di Med. Milan, Gennaio*, 1865.)

6th labour spontaneous but difficult, child still-born.

7th labour terminated by means of Cæsarian section.

hardness of its bones, by its uniform surface, by its dimensions remaining subnormal, and by the great distance between the anterior superior spines. The remaining bones of the skeleton present the alterations that are peculiar to rickets.

The pseudo-osteo-malacic pelvis has only rarely been described in the adult. It was so first by Smellie and Stein (*cf. Litzmann, l. c., p. 92*); *cf. also Fasbender (l. c.), and Fehling in the Report for the Stuttgart Lying-In Institution for 1878.*

c. The Spondylolisthetic Pelvis.

§ 566. By *spondylolisthesis* (figs. 102 and 103) has been meant, ever since the time of Kilian, the detachment of the last lumbar vertebra from the sacrum, and the consequent gliding forwards of the lumbar vertebral column under the influence of the weight of the trunk. The lumbar vertebrae thus come more

or less to block up the entrance to the small pelvis, and to form a roof over the pelvis (pelvis obtecta—Kilian). The last lumbar vertebra slips down from the upper surface of the sacrum into the pelvis, in such a way that its lower surface lies against the upper portion of the anterior surface of the first sacral vertebra, or even entirely covers the latter: indeed it may reach to the



Fig. 102.—The Prague spondylolisthetic pelvis (Kiwisch), now in Würzburg.

second vertebra. If the intervertebral cartilage is lost or only partly retained, the lowest lumbar vertebra may become more or less closely connected with the anterior surface of the sacrum, and even united with it by bone. As a result of this displacement, the anterior surface of the last lumbar vertebra is directed more or less downwards, and from it the following vertebrae rise

up in the form of an arch. Which vertebra approaches nearest to the symphysis, and thus takes the place of the promontory, will vary with the degree of the roofing in; it may be the edge of the fourth, or the connection between the 3rd and 4th, or even that between the 2nd and 3rd which projects furthest. The



Fig. 108.—One of the spondylolisthetic pelvis at Prague, described by Weber.

anatomical C. v. thus loses its obstetrical importance, since it is replaced by another conjugate lying high above it, and the length of which may sink as low as 5 cm. (2 in.).

Further, the general conformation of the pelvis, as well as the relative position of the iliac bones and sacrum, are altered as a result of the displacement of the lumbar vertebral column, and

these alterations resemble those met with where a kyphosis is situated very low down. The displacement forwards of the centre of gravity is compensated for by a lessened pelvic inclination; the anterior portion of the pelvic ring is raised; the symphysis is steep, the true promontory is at, or below, the level of its upper edge. The weight of the trunk drives the upper end of the sacrum backwards, and this, owing to the "saddle" which is produced by the displaced vertebral column, forms a projection backwards, and alters the position of the posterior portion of the iliac crests. These latter are driven apart, the dist. Cr. 1. is greatly increased, the angle of the posterior curvature is more rounded than usual, the distance between the posterior superior spines is lengthened, and the angle at which the posterior curvature of the iliac bones converges towards those spines, is more obtuse. The sacrum descends steeply, the lower end projects far into the pelvis, and causes a narrowing of the sagittal diameter of the outlet. The divergence of the iliac bones, and the strong tension exerted by the ilio-femoral ligaments (these are thrown strongly on the stretch through the diminished pelvic inclination), cause a transverse narrowing of the pelvis, and indeed increasingly so towards the outlet, a matter which may have an important bearing on the mechanism of labour. Moreover unusual mobility at the pelvic joints, due to the rotation of the sacrum, has been observed, much as obtains in a kyphotic pelvis.

§ 567. The spondylolisthetic pelvis, like the ankylosed transversely contracted pelvis, is one of the rarest varieties. It was first described by Rokitansky, but Kiwisch and Seyfert drew attention to its obstetrical significance. At the present time about 12 certain examples are known: the two pelves at Vienna (Rokitansky, Späth¹), the first Prague pelvis (now in Würzburg), the Paderborn² pelvis, 2 described by Breslau (one in Munich, one in Zürich), the pelvis of Olshausen (Halle), and 2 lately described by Weber at Prague. Some observations have been made during life by Breisky, Weber, Hartmann; others are less trustworthy³.

¹ For further information in regard to these pelves, cf. Chiari, Stricker's *Med. Jahrbuch*, 1878, p. 61.

² Paderborn is a town in Westphalia (Tr.).

³ Scheding (*Prag. Vierteljahrsschrift*, 131, 1876) has collected 15 cases; Brodsky's case, which was seen during life, makes 16.

§ 568. Since the close connection of the vertebral column with the sacrum is entirely due to the *sacro-lumbar articular processes*, spondylolisthesis can only occur, when *those processes are destroyed*, or when they are raised from their niches after rupture or stretching of the ligaments. All the other factors which have been suggested as causes for the displacement of the 5th lumbar vertebra (*sacro-lumbar spina bifida, formation of a rudimentary supplementary vertebra in the lumbo-sacral articulation*), can only be looked upon as favourable to that displacement. The actual cause is dislocation of the last lumbar vertebra; and inasmuch as a force which is able to produce this, must be very considerable, it is clear that such dislocations will generally be accompanied by fractures.

Spondylolisthesis might, on account of its ætiology, be expected to be of rare occurrence, for injuries to the oblique articular processes of the vertebrae are extremely uncommon, and especially in the lumbar region. It is likewise in harmony with our view of the ætiology, that where the origin of the displacement is known with any accuracy, that origin is of such a nature as would produce those injuries (*e. g.* a fall or leap from a considerable height). The absence of paralysis after dislocation and fracture may be explained by the fact that the nerve roots, into which the spinal cord has divided, do not nearly fill the whole of the lower end of the vertebral canal, that those roots are surrounded in that region by a firm sheath, and that they lie so loosely together that they can adapt their position to a progressive dislocation. For it must be remembered that the gliding of the last lumbar vertebra downwards, when it is no longer held sufficiently firmly in its place by the articular processes, always takes place gradually, being caused by the superincumbent weight of the body; the displacement being more extensive, the earlier during life it became possible.

§ 569. The *diagnosis* of spondylolisthesis is mainly based upon the great depression of the lumbar region, this being in striking contrast to the upper end of the sacrum, which projects well backwards. An extremely noticeable saddle formation will therefore be observed above the sacral region, which cannot be made to disappear, however much the trunk is flexed. Moreover, the inclination of the pelvis is diminished and the abdomen distinctly shortened, while the thorax and extremities remain

of normal shape ; the sacral and gluteal regions are broad, high, steep, and almost vertical. Additional peculiarities are : the prominence of the posterior superior spines, the divergence from them of the ascending posterior divisions of the iliac crests, the projection of the hips at either side so as to form an angle, the prominence and relatively great distance between the Cr. I.

The internal examination, which may sometimes be made *per rectum* with advantage, will clear up the case, inasmuch as it will be possible to feel the angle between the prominent lowest lumbar vertebra and the anterior surface of the sacrum. If the accoucheur palpates the sides of that vertebra, he will notice that it rises directly from the surface of the sacrum, and also from its lateral masses, forming a sharp, well defined angle (*i.e.* unless osteophytes &c. have deformed the lumbar vertebrae and the surface of the sacrum), which is not the case when the sacrum is merely bent at an angle, or when the promontory is a very jutting one. In the latter cases the ale of the sacrum always slope backwards from the promontory, while in spondylolisthesis the lateral masses of the sacrum can be followed up above the angle. In addition to these characteristics we often have the important fact that, owing to the displacement of the vertebral column downwards, the bifurcation of the aorta, either the aorta itself or its two branches (common iliac arteries), can be palpated (Olshausen).

§ 570. *Prognosis and treatment* will depend on the degree of contraction, that is associated with the displacement of the vertebrae. In comparison with other contractions of the same severity, but due to other causes, the spondylolisthetic form is always the more serious, since it begins at a more or less high level above the pelvic brim, is continued into the pelvic cavity, and since the transverse diameter of the latter is also diminished. In the majority of the cases that have been observed, Caesarian section was required ; perforation has been less frequently performed. The induction of premature labour will only be permissible, where the deformity is very slight.

f. Pelvic Deformity due to Dislocation of the Femur.

§ 571. (1) *Where the femur is dislocated on both sides* (fig. 104), the pelvis is unusually much inclined. This is partly owing to the posterior displacement of the heads of the femora, which

causes the trunk to be thrown back and thus increases the lordosis of the lumbar vertebral column, but it is mainly due to ilio-femoral ligaments being unduly stretched in consequence of the displacement, and to the pelvis being tilted more and more forwards by the pull of those ligaments on their points of attachment (sc. the anterior inferior spines); the pull of the ilio-



Fig. 104.—Pelvis with dislocation of both femora (after Depaul).

psons muscle, which is inserted into the trochanter minor, acts in the same direction.

The iliac alae are placed steeply; this is a result partly of the pressure of the heads of the femora, and of the increased tension of the iliacus internus which passes round the anterior border of the ilium towards the trochanter minor, which lies higher than it should, partly of the action of the abdominal muscles; on the

other hand it is assisted by the action of the glutei being diminished. The sacrum is driven far down into the pelvis by the body-weight and by the lumbar lordosis, and lies more horizontally than usual, the vertical excavation of its anterior surface also being increased; the coccyx is usually bent sharply forwards. The whole pelvis, but especially the anterior half-ring, is delicate and very shallow; the rami of the pubic arch are long, flattened from before backwards and twisted forwards; the ischial tuberosities are drawn upwards and outwards by the action of the muscles, the pubic arch is wide. The point at which the ilio-psoas passes over the pubic bone below the anterior inferior spine, presents a deep groove. The slenderness of the pubic region is due to the diminished weight that is borne by the anterior half-ring of the pelvis, a condition which must necessarily accompany the dislocation of the femora backwards (Küstner).

§ 572. *The pelvis is thus extremely wide from side to side, and the transverse diameters increase in length towards the outlet; the sagittal are shortened, most at the brim, least at the outlet. The pelvis therefore is a flat one, although the flattening never reaches the extent that it sometimes does in rickets. In the majority of cases the C. d. is about 9—10 cm. (3·5—4 in.) in length; but once it has been observed (Gueniet) to measure only 7 cm. (2·75 in.), and once to be of normal length.*

The difficulties associated with this pelvis during labour, will therefore not be very great, and as in an ordinary flat pelvis will generally be at an end, so soon as the head has passed the brim. Secondary anomalies are more apt to occur; thus even during pregnancy the pendulous condition of the abdomen and the great mobility of the uterus with their sequelæ may call for attention.

§ 573. (2) The alterations in the pelvis that are associated with *unilateral dislocation of the femur*, have lately been carefully investigated by Leopold. He finds that the shape of the pelvis varies according as the dislocation is congenital or acquired, and according as the lower limbs have, or have not, been used: moreover with acquired dislocation the shape depends on whether the displacement occurred before, or after, the complete ossification of the pelvis.

In all pelvis the side of the dislocation undergoes atrophy. The use of the limbs always widens the brim and outlet in a transverse

direction. Disuse contracts the brim in youthful individuals, where the dislocation is congenital; in other persons it makes it wider, but the outlet is always diminished. (In Valenta's case however, *cf. Monatsschrift f. Geb.*, xxv., p. 161, the outlet was increased, possibly by attempts at progression.)

Where the dislocation is congenital, the sacrum always inclines to the injured side. It also does so in the cases of acquired displacement, when this commenced early, has been followed by great atrophy, and when the legs have not been used. In all other cases the sacrum is inclined towards the healthy side, or else remains approximately straight. Its asymmetry may be due, according to the degree of atrophy, either to an unilateral retardation in growth, or to the pressure of the body-weight and thighs; in the latter case ankylosis of the ilio-sacral articulation concerned is also possible (*cf. Kuster's case in Archiv f. Gyn.*, viii., p. 326).

The pelvic half which corresponds to the dislocation, is therefore narrower in youthful, although not in adult, individuals, where the dislocation is congenital. It is so also in all cases where the dislocation has been acquired at an early date, and in which attempts at walking have been made; in all other cases it is wider. The position of the symphysis agrees with this: where dislocation occurred early and no attempts at progression have been made, the symphysis lies straight in front of the promontory, or has advanced towards the healthy side; where the dislocation has taken place later, and the person has not walked, the symphysis will be drawn towards the diseased side as the pelvis widens; if however the limbs were used, it invariably remains towards the diseased side. The healthy acetabulum is drawn upwards and forwards into the pelvic cavity by use of the leg; the diseased is driven outwards, backwards and downwards.

The two halves of the pelvis are therefore asymmetrical in form. They may either be not at all obliquely distorted, or they may be obliquely distorted, but not obliquely contracted, or they may be both together. The dislocated side is sometimes the narrowest, sometimes the widest, this depending on the date of the dislocation (whether congenital or acquired), and on whether the lower limbs have been used or not. These pelvises bear a striking resemblance to those met with in disease of the hip-joint. The obstetrical importance also is the same as the one case.

depends on the width of the whole pelvis, and on the degree of the distortion and unilateral contraction.

g. Pelves Deformed by Tumours and Exostoses.

§ 574. *Tumours, which arise from the pelvic bones, project into the pelvic cavity and block it up are extremely rare, although the literature of clinical medicine contains quite a collection of such cases; their rarity causes them to be generally published. As a rule they originate from the posterior pelvic wall, from the anterior surface of the sacrum and its articulations, next in frequency from the symphysis; most are carcinomata, although sarcomata, fibromata, and even enchondromata may occur. Amongst the non-bony growths, those which arise from the posterior and lateral portions of the pelvis, are usually fibromata, those springing from the anterior bony walls enchondromata or malignant tumours. According to their size and position, the tumours lead to narrowing of every kind; they may completely fill the pelvic canal. When very hard, they may be highly dangerous in spite of being small, and from this point of view true exostoses are especially to be dreaded.*

§ 575. *Pelves with multiple exostoses appear to be somewhat more common, and generally co-exist with multiple exostoses of the entire skeleton. My pupil Neuenzeit has in his Dissertation referred to a number of such pelves, and since it was written, Leopold, Kormann and Stadfeldt have described additional specimens. These pelves are rendered all the more dangerous by the fact that they appear to be almost invariably contracted (apart from the presence of the growths); they usually belong to the generally contracted rickety, or to the obliquely contracted, variety, and there is great risk of the genital canal being rubbed through by the exostoses, even when these are very small (they are rarely very large). The simultaneous presence of an almost always rachitic pelvic contraction and of multiple exostoses throws some light on the origin of the latter.*

The prognosis where a pelvis is affected with exostoses, is therefore bad for mother and child. If the bony growths are numerous and greatly developed, if they are placed at opposite sides of the pelvic cavity, and if the pelvis is at the same time independently contracted, the best course will be to deliver by

Cæsarian section. Where however the existing conditions are less unfavourable, other procedures may of course be allowable. The above remarks show that in all cases where multiple exostoses or enchondromata are present, similar new formations in the pelvis may be suspected, and the latter therefore must be examined as early and accurately as possible with the whole hand, and under chloroform. Unless this is done, impending dangers will be discovered too late.

§ 576. We have already spoken (§§ 494 and 524) of the sharp edges and spines, which are occasionally found in contracted pelvis along the ilio-pectineal line (*pelvis spinosa*, *akanthopelys*—Kilian), and indicated the risk that is associated with their presence. They may either be found in the form of a very prominent sharp pubic crest, or of a pubo-iliac synostosis which is pointed, and has been drawn out to a spine (as much as 1 cm. = .5 in. in length), and owe their origin to muscular traction; the last-named spine does so especially to the insertion of the *psoas minor*, which is concentrated upon it.

Fischl (*Prag. Medic. Wochenschrift*, No. 9, 1880) and Duncan (communicated by letter) have observed considerable, isolated, pointed, periosteal outgrowths on the *promontory*, probably caused by injury associated with a previous labour.

§ 577. Moreover fractures of the pelvic bones, although generally fatal owing to simultaneous injury of important organs, may heal so irregularly and give rise to such abundant callus, that the pelvic cavity is considerably narrowed by the permanent displacement of the bones and by the projecting callus; and this is all the more apt to occur, since the fracture is generally caused by considerable violence, and therefore extends to several bones. A number of these extremely rare cases have been collected by Lenoir ("Déformations du bassin par cals difformes", *Archiv. génér. de Med.*, Jan., 1859, p. 5); additional clinical accounts may be found in Nægele-Grenser's *Lehrbuch*, p. 527. In Barlow's case the pubic bone was fractured, and the resulting callus was so abundant as to reach to within 1.5 cm. (6 in.) of the *promontory*; the patient was saved by abdominal section after rupture of the uterus. The Dupuytren Museum contains a pelvis (without history), one of whose acetabula has been badly fractured, and has healed in such a manner that the callus projects into the pelvic cavity to the extent of 4 cm. (1.5 in.); the

anterior portion of the iliac bone is displaced in a similar direction.

§ 578. Lastly, I must refer to *ankylosis of the coccyx* with the sacrum, and to that of the separate coccygeal vertebrae to one another. These forms of immobility prevent the size of the pelvic outlet from being increased, as it usually is by recession of the coccyx, and may thus interfere with the course of labour, by affecting the form and width of the outlet. This anomaly however is not very important; it is described more in detail by Trefurt (*Ueber d. Ankylose des Steissbeins*, Göttingen, 1836). In my hospital practice it has occurred a few times, and amongst them fracture occurred twice, and dislocation of the ankylosed bone once. Moreover a *coccyx* which has been previously ankylosed, or which without such ankylosis has been *dislocated inwards or sideways*, may also prove an obstruction in a subsequent labour, if after recovery it has remained permanently in its abnormal position.

h. The Split Pelvis.

§ 579. Litzmann has applied this term to pelves in which the symphysis is congenitally defective, in which the symphysis is fissured. This condition almost always co-exists with fissure of the abdominal walls and bladder (Walter's case is the only one in which a fissured symphysis accompanied normal closure of the abdominal parietes), and has therefore only a secondary importance¹ in practical midwifery. Nevertheless this variety is of high interest, as showing very distinctly the influence which the weight of the trunk &c. has upon a pelvis, which possesses but little power of resistance. The result of this malformation is a form of pelvis such as we are otherwise only accustomed to see, where there is severe rachitic disease. The sacrum is strongly driven in between the iliac bones, the bodies of the sacral vertebrae are pressed unusually far forwards in relation to the alae, the whole bone is stretched in the direction of its length, and the anterior concavity diminished in both directions; the divergence of the iliac bones anteriorly, and the transverse expansion of the pelvis are greater than normal. The great transverse expansion of the pelvic ring is caused by the absence, or great diminution, of the resistance

¹ This is especially true of the severest forms of the malformation, which Ahlfeld (*Archiv f. Gynäkologie*, xii, p. 166) has called "*pelvis inversa*."

under normal conditions, is offered at the symphysis to the dislocations that have been mentioned, the interval between the bones being in these cases either merely filled up by the elastic portions of the perineum, or by a strong fibrous ligamentous band. Again, when once these changes in shape have taken place they will be all the more permanent, the less the but slightly movable ligaments, lying between the pubic bones, can assist the iliac bones in regaining their previous position, after the pressure has been removed. The pelvis therefore is a *flat* one, although the deficiency of the symphysis prevents the flattening from becoming complete, as is the enormous transverse expansion, especially of the anterior half of the pelvic ring.

In the two cases described by Freund and Gusserow showing alterations in the shape of the pelvis which have just been mentioned, are not invariably present, or may only be so to a certain extent. Both authors think, and probably rightly, that the occurrence of such alterations must be attributed to ankylosis of the ilio-sacral joints, due to the persistent pressure (which is increased by the increased eversion of the iliac bones) forcing the articular surfaces one upon the other. Such osseous union is not necessary, in order to give the unclosed pelvis the requisite firmness. At any rate progression may be secured without it, as is proved by an observation which we have recorded.

We may refer to a somewhat similar pelvis described by Winkler (*J. Gyn.*, i., p. 346), in which the transverse expansion was due to the fracture of the pubic bone. It occurred in a girl, *æt.* 17 years, whose pelvis, when she was a few weeks over a year old, was fractured, by being driven over. As a result of this accident, the right pubic bone seems to have been detached at the fracture, and subsequently united to its fellow by soft ligamentous masses to the right pubic bone. This pelvis, like other split pelves, was

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3. Anomalies of the Sexual Organs.

The anomalies of labour which are caused by malformation and abnormal positions of the uterus, have already been discussed under Pathology of Pregnancy (*cf.* §§ 272—286, 295). Here therefore I have merely to deal with atresia and rigidity of the genital canal, and with the disorders that are produced by tumours of the latter and its neighbourhood.

a. Occlusion, Contraction and Rigidity of the Soft Parturient Canal.

(1) Of the Cervix Uteri.

§ 580. Occlusion and contraction are only met with at, or a little above, the external os. When complete, they must of course have originated subsequently to conception, and the case must then be one either of cicatricial origin, or due to simple agglutination; both are equally rare.

Cicatricial atresia is a result of ulceration, which may either be due to a lying-in period¹ that has soon been followed by a fresh pregnancy, or to attempts at bringing on abortion, or to cauterisation of the portio vaginalis² during pregnancy, or to syphilis. Occlusion is all the more apt to be produced by one of these causes during pregnancy, since the discharges, which at other times keep the os patulous, are then either absent or very slight. The occlusion may extend for a little way up above the external orifice, but is usually confined to the lips. Velpeau records a case of this kind, in which active cauterisation, made with the object of bringing on abortion, led to the formation of a firm triangular cicatrix, which retarded delivery for several days.

In these cases the os uteri does not open up, in spite of strong pains. The cervix is greatly stretched, and finally driven far down by the pressure of the ovum, and enormously thinned: indeed its lowest portion and the vaginal fundus may be broken through. This is all the more likely to occur, when the os does not lie, or continue to lie, in the axis of the parturient canal, but is displaced backwards (in very rare cases forwards), in consequence of which the anterior portion of the cervix bulges far downwards.

The *diagnosis* is probably always easy, since the cicatrised spot can be readily recognised by the finger. It is only when the parts are greatly expanded, thinned and smoothed out, that difficulties are likely to arise; similarly when the seat of the orifice is displaced far backwards, and cannot easily be reached by the examining finger. Under such circumstances, practitioners have repeatedly failed to recognise the stretched

¹ Cf. Dietrich's case in *Petersb. Med. Wochenschrift*, No. 10, 1878; the occlusion however was incomplete.

² Cf. inter alios Chambaud, *Arch. Tocol.*, 1876, p. 513.

lower uterine segment and vaginal fundus, believing the presenting head to be only covered by the fetal membranes. Such a mistake may always be avoided, if in any case of difficulty half the hand is used in making out the direct continuation of the vaginal wall with the membrane covering of the presenting part; and even when the occluded spot cannot be felt, it can always be recognised by the eye. In such a case therefore it may be necessary to expose the vagina with a large Sims' or other speculum, a proceeding which can be best carried out in the lateral posture.

The same course should be adopted, when the *occluded region is to be opened*. The latter will hardly ever open spontaneously, so that there is no use delaying the operation. The best plan is to seize the cicatrix with a tenaculum, and to divide one thin layer after the other; they should not be directly pierced, for fear of injuring the child. It is unimportant whether the membranes are opened or not, since the operation should not be done till the presenting part has stretched the cicatrix and surrounding parts, *i.e.* during the period of expulsion. Further, only the cicatricial tissue is to be divided. As soon as this is done, the edges of the cervix will generally start apart, as happens when an elastic band is cut. The rigidity of the surrounding tissues will rarely be so great, as to make it necessary to prolong the incision through them in several directions. If neither assistant nor special instrument are at hand, the opening may be made by means of a bistoury, guided by the fingers. The incision should always be made as much as possible in a line with the transverse diameter of the pelvis.

§ 581. *Adhesive closure of the lips of the os (conglutinatio orificii externi—Nægele)* may either be caused by their being superficially united by true tissue (*adhesive inflammation*, consequent on vaginitis or endometritis colli, or on mechanical irritation), or be due to a collection of inspissated epithelium (*epithelial atresia*). In such a case neither cicatricial tissue nor induration can be felt with the finger, and the os uteri may either not be detected at all, or else it merely presents a shallow groove, which is very apt to be overlooked. Such a membranous occlusion is generally spontaneously remedied, when the ovum is forced down; but if it detains the latter, it must be ruptured by the pressure of a finger during a "pain", or by the uterine sound.

In rare instances however the occlusion appears to offer considerable resistance, especially where the os is very small, and the surrounding tissue very unyielding¹; the lower segment of the uterus may then, as with cicatricial atresia, be extremely thinned, stretched, and even broken through. But with such a condition, the obstacle to dilatation probably lies not so much in the resistance of the occluded os, as in the *tissue of the portio vaginalis*. It may doubtless also arise from the fact that the *expulsive forces do not act directly on the occluded spot*, and when this is so, the orifice is almost always displaced far backwards and upwards (extremely rarely forwards and upwards), and the anterior (or posterior) cervical wall is deeply bulged. Indeed under such circumstances it may be extremely difficult to find the situation of the os, although the attempt will succeed, if made as recommended in the previous paragraph. If an opening is made as there described, and the edge of the os drawn by the finger in the right direction, the obstruction will easily be remedied. I can hardly believe, as some authors state, that it can ever be absolutely necessary to cut through the bulging cervical wall.

In exceptional cases, instead of the adhesive inflammation leading to agglutination at the margins of the os, a condition arises, in which the mucous membrane on a very short portio vaginalis roofs over the os like a valve, generally from in front, and grows adherent to the vaginal wall lying opposite to it. No pit will then be found at the situation of the os uteri. The adhesion however under such circumstances is properly speaking in the vagina².

Such occlusion of the os is not always a trivial matter, as is shown by Mattei's collection of cases, in which 36 operations were found necessary amongst 42 patients; 3 women died. In 28 cases in which the operation was not done till late, 7 children were still-born, and 2 of the mothers died.

§ 582. The dilatation of the os may also, when circumstances are otherwise quite normal, be prevented by the *fetal membranes being firmly adherent to the decidua at the lower segment of the*

¹ This contraction and resistance of the external os very often co-exist with agglutination, and seem greatly to favour the production of the latter.

² The case recorded by Hecker in his recently published *Beobachtungen und Untersuchungen*, Munich, 1881, p. 168, is similar to this.

uterus, so that the latter cannot retract from the ovum. Rupture of the membranes or detachment of the adhesion, if recognised, will clear up the difficulty. The adhesion may doubtless exist without obstructing delivery; at any rate it explains many an isolated rupture of the chorion and its retraction from the amnion during labour.

Organic adhesion of the lower end of the ovum with the cervical wall, in the periphery of the external os, is still rarer (Hecker records a case in *Klinik der Geburtskunde*, 1861, i., p. 119; and Litzmann one in *Archiv f. Gynäkologie*, x., p. 130). It is caused by the end of the ovum penetrating into the cervical canal during the last portion of pregnancy, and by the adhesion of a layer of decidua to the mucosa of the cervix, which has been bereft of epithelium.

§ 583. Occasionally the occlusion of the cervix is incomplete, a minute aperture remaining at the os; there is then merely *cicatricial stenosis*¹. Such a condition may of course have existed before conception, since the spermatozoa can, as we know, find their way through capillary openings, or it may arise during pregnancy (syphilitic ulceration). It is best in such a case to make one or more incisions, varying their length with the extent of the cicatricial tissue, and cutting down on the finger. Or the operation may be performed through a speculum by means of a probe-pointed bistoury or a pair of scissors, a moment being selected when the parts around the os appear well stretched.

§ 584. Commoner than the conditions described above, is one in which *the os presents a certain degree of resistance*, of so-called *rigidity*. This is either a consequence of a true cicatricial formation, or, as is the rule, of fibrous hypertrophy. The best examples of the latter are seen with prolapse of the uterus, even when it has been returned during pregnancy. The edges of the os may then be covered by a thick, inelastic, sometimes leathery lining, and by their rigidity so greatly retard delivery, that they, together with the child, are driven down to, and even out of, the vulva; the lips may actually be torn off, or subsequently slough.

¹ (*f. inter alios* the cases (primiparæ) recorded by Hayn and Lutz, in *Berl. Klin. Wochenschrift*, Nos. 10 & 36, 1870; by Courvoisier in *Schweizer Corr.-Blatt*, No. 18, 1874; by Liebmann in *Zeitschrift f. Geburtak. u. Gyn.*, li., p. 61; Benicke, *ibid.*, p. 252; Welponer, *Wiener Med. Presse*, 1880, Nos. 22--24.

The merely hypertrophied lips of the os, although at first but little yielding, gradually grow soft and relaxed during the pains, so that it is rare for such a condition to give rise to serious delay; I have never met with anything of the kind. Sometimes however the lips may be severely bruised, and become œdematous. The spontaneous softening may be greatly encouraged by forbidding the woman to bear down, by warm vaginal irrigations, by applying pressure with the help of intra-cervical india-rubber bags, or, if the os continues very narrow, by sponge or laminaria tents. In case of necessity, several incisions should be made, their extent being determined by the cicatricial tissue and the induration. They are best made at the sides; if made in front and behind, great caution is required. Incisions are most necessary, where hypertrophy complicates prolapse¹.

(2) Of the Vagina.

§ 585. *Complete vaginal atresia* is extremely rare in obstetric practice, since it must have originated during the previous pregnancy. It may however develop as a result of the so-called diphtheritic inflammation which occasionally accompanies acute infectious diseases (cholera, relapsing fever, variola &c.), for of course these do not always end fatally even in pregnancy, or of superficial colpitis due to incidental causes. Moreover artificial occlusion of the vagina, which has been produced for the purpose of indirectly remedying a urinary fistula, is sometimes followed by impregnation *per urethram*, as I have once known to happen. This occlusion, like the partial variety, is either deep and cicatricial, or superficial and membranous.

Partial adhesion is for obvious reasons the commonest. It may either result from the processes referred to above, or (as more often happens) from previous puerperal endocolpitis. The opposed surfaces may then either simply be adherent to one another, or there may be a considerable, tight, cicatricial constriction. Occasionally too the cicatricial tissues and bands lie only on one side, or else *cicatricial bands* pass from the vagina to the portio vaginalis, and connect these closely together.

¹ The induration here may be so great, that even incisions do not make spontaneous delivery possible. In November 1878, I was obliged, even after making incisions, to apply the forceps, to draw the cervix with the head into the vulva, and then to continue to deepen the incisions, until I found it possible to extract the head without risk of dangerous lacerations.

§ 586. *Cicatricial atresia and stenosis* constitute a very dangerous complication of labour, since the cicatricial tissue does not share in the softening which is associated with pregnancy and labour. There is not always sufficient room for the child to pass, even when the stricture has been cut; the cicatricial tissue may extend so far that a complete division would necessarily involve neighbouring cavities and require incisions into the connective tissue. Nevertheless it may be requisite to make such deep incisions, in order to prevent the surrounding tissues being seriously damaged.

It becomes a matter therefore of much importance at an early period to get as clear an idea as possible of the extent of the stenosis. When that has been done, it may often be desirable, and even necessary, for a while to watch the action of the "pains"; but the practitioner must not wait too long, or else the dreaded laceration will take place unexpectedly. He should in good time decide what treatment he will adopt. No great benefit accrues from dilatation with blunt instruments or tents; *deep incisions are almost always necessary*. When however there is reason to expect that even the incisions that have been made, will tear further, or that the delay will be long and dangerous, *he should without much delay perforate the foetus*.

But even these severe operations do not always attain their object, namely that of preserving the mother; I myself have met with an instance in which I deeply regret not having at once extracted the child by *Cæsarian section*. Where therefore the condition of things from the very start makes extensive injury to the vagina and its neighbourhood probable, I recommend the practitioner at once to resort to the last-named operation; the extraction of even a mutilated child through a contracted, incised and lacerated canal is an operation involving the greatest danger to the mother¹. Under such conditions the artificial induction of premature labour may undoubtedly sometimes save life, and even artificial abortion may be allowable.

§ 587. *Superficial adhesions (Verwachsung)* not infrequently yield under the influence of the pains, and especially under the

¹ Galabin has performed Cæsarian section under such circumstances (*London Obstet. Transactions*, xviii, p. 252), although with unfavourable issue. Benicke (*Zeitschrift f. Geburtsh. u. Gyn.*, 1878, pp. 260—1) also recommends the operation, although without remembering that I had previously given similar advice.

pressure of the advancing child. The occlusion, if complete, may in this way be forced open; where partial, what opening exists is widened, its edges become thinner and less tense. Even in these cases however artificial dilatation and enlargement are probably always necessary, and, although dilators may be of great use, *the knife as a rule will be found most serviceable* in widening the passage. The practitioner however should not be in a hurry to make incisions, but for a while at least patiently watch the effect of the "pains". The actual incision is best made during a "pain", since the tension is then at its highest; the point of greatest resistance too can be most accurately determined, and the action of the knife most easily kept under control. Again the incision is then most easy to make, owing to the tension. It is a good plan moreover, before using the knife, to introduce the finger into the rectum or the bladder (the urethra must first be dilated, but this is easier during labour than at other times), so that it may control and direct the incision. When the child enters the stenosed portion, the incision may, if necessary, be increased, so as to prevent the parts from tearing further; in some cases artificial extraction may be indicated.

§ 588. There are several other conditions which must be treated on the same principles as stenoses: *unilateral contraction*, which may lead to danger by causing the canal to be unequally dilated, and the healthy portions to be unduly stretched; the presence of *cicatricial bands*, which connect the portio vaginalis with the vagina, or of *sagittal or transverse septa*. The thicker and tighter the bands, the more important it is to prevent their tearing spontaneously, since such tear will take place at the point of attachment, and is apt to involve the neighbouring tissues, as I have seen occur. Such bridges must be divided in their continuity, either with a knife or with scissors.

§ 589. Apart from these cases of acquired stenosis, *congenital narrowing of the vagina* is occasionally found, and this may either affect its entire length, or be restricted to a circumscribed portion, where it forms a concentric ring projecting into the lumen. These conditions however rarely constitute a serious obstacle to the child. A *uniformly contracted vagina* becomes softened and dilated under the influence of the hypertrophy and softening of pregnancy, as well as under the influence of the

quins. At most does it lead to superficial lacerations; very rarely to deep ones. The best way of overcoming difficulties, if they arise, is to maintain a patient attitude, to give the woman suitable directions, and, if necessary, to dilate with thin-walled india-rubber bags filled with water. The same is true of the ring stenoses that have been mentioned, where however it is often wiser, and frequently necessary, to incise.

(3) *Of the Vulva.*

§ 590. An uninjured and entire hymen is not very uncommon in primiparæ. The membrane may either have been so flaccid and elastic, and its opening so wide, as to allow of *immissio penis*; or if not, conception took place without the latter, the hymen being, during coitus, pressed in towards the vaginal lumen, and thus approximated to the os. Even such displacement however is not absolutely necessary, since conception may take place, if the semen is merely deposited in the *introitus vaginae* and in front of the hymen, and if a small quantity passes through the narrow aperture into the vagina.

(I have seen a case of pregnancy in a woman, whose vagina had been intentionally closed in its urethral portion on account of injury to the bladder, and where an opening no larger than a pin's head remained; the possibility of insemination *per urethram* could be excluded.)

The hymen will only prevent the exit of the child, when it is very thick, tight and resistant. As a rule it yields under the pressure of the descending part, and either tears, or becomes unfolded, so that it merges into the surrounding mucous membrane. In the latter case it may gradually reform after delivery, and again be found present at a subsequent labour, although in a somewhat relaxed and narrow condition, and with a more or less damaged edge. If however the membrane really causes delay in delivery, it must be divided with knife or scissors in one or more places; for a spontaneous rupture, passing through a fleshy and tight hymen, might extend a long way into the vestibule, or even into the nymphæ (Boivin and Dugès). Occasionally too the hymen remains entire, while its free edge is torn off along the attached border. Should such a hymen be found during pregnancy, there can be no reason for not immediately cutting it through.

§ 591. Organic adhesions affecting the external generative organs, never completely occlude the passage; an aperture is

invariably left. The adhesion may be superficial, without any cicatricial tissue being visible, and may then look as if it were congenital; or else it may be due to deep ulceration of the vulva, which has been followed by tight cicatricial tissue. The cause may be some superficial inflammation, that occurred during childhood, or else ulcerative processes (due to infectious diseases), scalds, injuries, or a perinæoraphy which has been carried too high. Superficial stenoses are, like a thin perinæum, easily broken through by the child during labour; but tough, thick, cicatricial tissue will neither stretch nor tear, and the head then, under the influence of the obstruction, turns backwards, and forces a way for itself through the posterior vaginal (*i.e.* anterior rectal) wall, and through the posterior portion of the perinæum. In order to prevent this, a passage must be opened for it in the normal position, by making a longitudinal cut in the line of adhesion; and since the cicatricial vulvar tissue in spite of this usually continues very resistant, the opening should be increased by carrying lateral incisions outwards and downwards, or, if necessary, by removing the cicatricial tissue. Even where the adhesion is quite superficial, operative division is preferable to spontaneous rupture. I need hardly add that, even after incisions, it is necessary carefully to watch the perinæum, and that in spite of them it may be necessary to extract the child artificially.

§ 592. The *perinæum* occasionally obstructs the exit of the child, in virtue of its *covering an abnormally great extent* (a congenital condition), and of its *rigidity*. In the first case the *rima pudendi* is narrowed by an enlarged and thick *frænulum*, and forms a small ring which at most only admits the *caput succedaneum*; when this is so, the child either bursts the perinæum behind the commissure of the labia, or else labour comes to a stand-still. To avoid this, sagittal and lateral incisions must be made through the commissure, and it is best to make them early. Where the rigidity of the perinæum is merely due to the tightness of its aponeurosis and of its skin, warm fomentations and fatty inunctions may always be tried first, but if the presenting part is much delayed, an incision should be made. The latter becomes still more often necessary, where the "rigidity" arises from cicatrices left by ulceration, or by previous ruptures or operations; but under such circumstances the cicatricial tissue must be avoided as far as possible,

since wounds passing through it, frequently will not heal by first intention.

§ 593. Now and then, for instance where albuminuria is present, the *vulva*, especially the labia and the perineum, become so *œdematous and swelled*, as actually to form an obstacle to delivery. A further danger lies in the bruising to which the swelled portions are subjected by the emerging head, an injury which I have generally seen followed by sloughing. A long longitudinal incision (one on each side) should under such circumstances be made on the anterior surface of the labia majora, before the head passes through, so that the serum may have time to ooze out, and the swelling of the parts to diminish. It is true that the cut surfaces are very apt to ulcerate, even when treated antiseptically, but the destruction is less extensive than that which follows bruising. Further, the exit of the child is facilitated by the incision, and if it hesitates at the last moment, the forceps may be applied, in order to avoid any long continued pressure on the *œdematous* parts. An additional advantage is that pressure can, with the help of the instruments, be more or less withdrawn from the most imperilled portions. (Cases in which labour is obstructed by hæmatomata, are described under the latter; cf. § 752 *et seq.*)

b. Tumours.

I have already in a previous chapter (§§ 296—302) discussed the effect that pregnancy has on new formations of the generative system, and have here therefore merely to deal with their importance, as disturbing influences during labour.

(1) Myoma of the Uterus.

§ 594. The disorders produced by *non-polypoid fibro-myomata of the uterus*, vary mainly according as the latter are *corporeal or cervical*; the former rarely impede delivery, the latter do so almost invariably. On the other hand the *corporeal* are apt to affect the *presentation of the fetus*, partly owing to the *distortion* in the shape of the uterine cavity to which they give rise, partly because, when they project far downwards, they prevent the head from engaging, and becoming fixed, in the brim¹.

¹ Lefour (*Progrès médic.*, 1880, No. 29) found that in 100 labours only 14 presentations were cephalic; 32.5 p. c. were breech and 16.5 p. c. transverse.

moreover the fetus has been found flattened by the tumour. The *pains*, especially in the case of true intra-parietal tumours, are frequently irregular and insufficient, a condition which can be explained by the absence of a general uniform contraction, and by the altered shape of the uterus; *hemorrhage* due to premature detachment of the placenta, and still more *post partum*, is therefore not uncommon. The "pains" sometimes cause extreme suffering, owing to the uterine walls being stretched by the myoma. This tension, taken in conjunction with the alterations in the structure of the uterine wall adjoining the new formation (atrophy), also explains the occasional occurrence of *rupture*. Lastly it must be mentioned that *post-partum inversion of the uterus* is more frequent than usual, inasmuch as the traction exerted by the tumour is superadded to the irregular con- and retraction of the organ. *Placenta praevia* also is comparatively common¹.

Corporeal fibroids can only encroach on, and block up, the parturient canal, when they reach very far down, or are attached wholly, or partly, to the lower portion, or when, being narrow and subserous in their origin, they hang down into the brim of the pelvis. In not a few cases the obstruction to delivery which at first seems so very great, entirely and spontaneously disappears during its further progress, owing to the fact that, as the internal os is retracted upwards and the uterine wall is shortened longitudinally, the tumour is drawn up out of the pelvis; moreover when the fetus advances into the brim, it pushes the growth still further to one side. This ascent however may be prevented by adhesion of the tumour to the brim of the pelvis, as happened in a case observed by Braxton Hicks (*London Obstetr. Trans.*, xi., p. 99).

The *treatment* of all the disorders that have just been referred to, can of course merely be symptomatic, and mainly consists in general prophylactic measures. Tumours which project into the pelvic cavity, must, if possible, be pushed up out of it, and it is well to attempt this early (*cf.* § 297). In any case however such displacement must be effected, as soon as the cervix is so far dilated that the fetal part, which during the operation is brought down into the pelvic brim, can confidently be expected to become fixed. When once this has happened,

¹ Lefour (l. c.); Chadwick (*Transactions Amer. Gyn. Society*, l., p. 256).

the difficulty is generally at an end. Indeed it is a proceeding which has frequently rendered unnecessary a Cæsarian section, which had been previously decided upon. The reposition may have to be effected under anæsthesia, and after introducing the whole hand into the vagina, or even into the rectum. The advisability of extirpating an irreplaceable corporeal fibroid during labour might under some conditions need consideration (*cf.* § 297).

§ 595. Cervical myomata are much more serious, and make the prognosis much more unfavourable than do the corporeal. The reason for this is that, even when small, they always narrow the parturient canal, that they can rarely be pushed up out of the way, and that, even if the canal allows the child to pass, they are always severely bruised.

Intra-vaginal fibroids are less dangerous than the subserous, since they are usually not so large, and in some cases can be removed before the child descends; sometimes this may be done by enucleation (Danyau was the first to operate in this way), sometimes by abscission, the latter proceeding not being specially difficult, provided the base of the growth is not unduly large and is accessible. But even if delivery *per vias naturales* is possible without such a radical measure, the head of the fœtus will certainly be severely bruised between the tumour and the opposite pelvic wall; indeed perforation is almost always required. As a general rule the forceps is for obvious reasons inadmissible. Where a tumour, lying in the anterior cervical wall, is crushed between the head and the anterior pelvic wall, the adjoining vesical wall may be torn, as is shown by two cases recorded by Barnes (*Obstetric Operations*, 2nd ed., p. 261). Occasionally an intra-vaginal cervical myoma may necessitate Cæsarian section.

The above remarks as regards tumours of the cervix also hold good of *fibroids of the vagina*, which are almost always attached to its anterior wall.

Porro (*Annal. Gynéc., v.*, p. 72) records a case of this kind, which was successfully terminated by enucleation; Fisher in Ulm (*Zeitschrift f. Wundärzte u. Geb.*, 1878, vol. 28, part 3) one which was extirpated with scissars.

§ 596. *Subserous* cervical myomata form, as has more than once been mentioned, the most dangerous complication. They are almost always retro-uterine, and can only quite exceptionally

be pushed up out of the way, i.e. when they are mainly intra-peritoneal, when they originate above the point of reflexion of the peritoneum, and have a narrow base. As a rule however they have grown downwards beyond the serosa, have pushed this

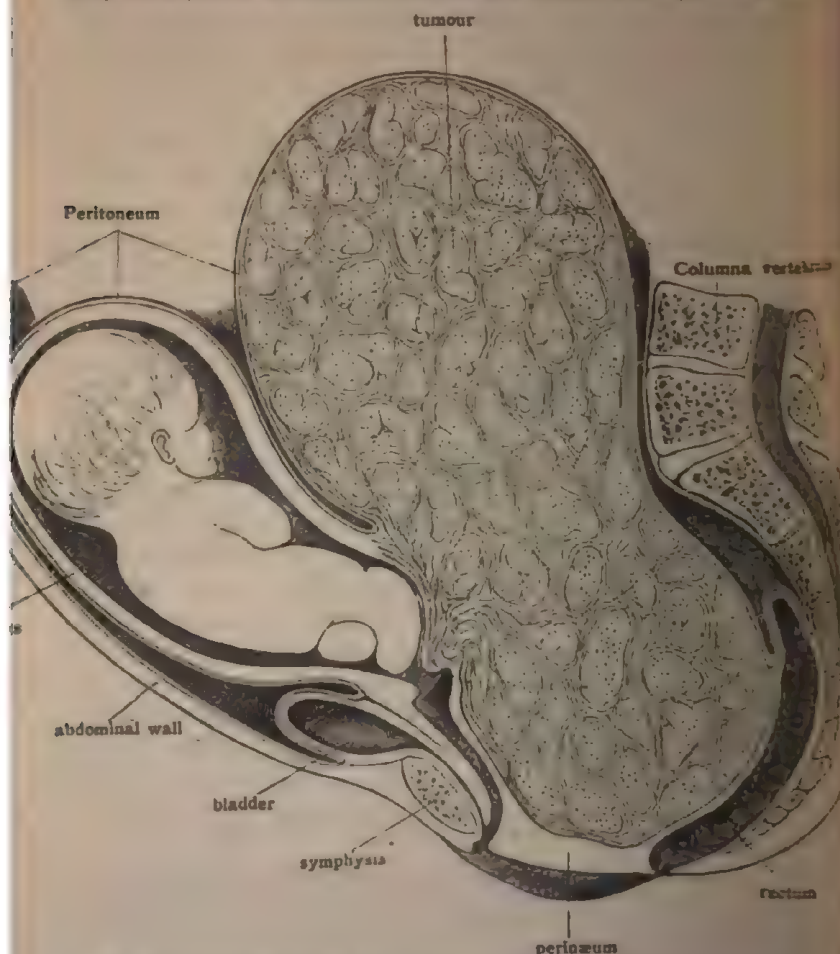


Fig. 105.—Retro-cervical subserous myoma. Labour came on at the full time, and was terminated by myself with the help of Cæsarian section (*Arch. f. Gyn.*, v., 1875).

up, and have thus become *retro-vaginal*. With such a condition, when the growth is at all large (and how great the dimensions may be, is shown by the case that I have published, and of which fig. 105 is an illustration), *Cæsarian section* is called for, since

there is no possibility of removing the tumour. Indeed as a matter of fact most Cæsarian sections performed on account of uterine fibroids, have been necessitated by retro-cervical growths. I have been able (*l. c.*) to collect 14 cases, all of which ended fatally, and in which 7 children are mentioned as alive. Cazin subsequently collected 22 cases of Cæsarian section, in which 3 mothers recovered, and 14 children were born alive; at a later date, the same obstetrician, induced by a work of Netzel's (*l. c.*), increased the number to 28 cases¹, only 4 mothers and 15 fetuses surviving the operation. Since then a further case (Porro's operation), which ended unfavourably for mother and fœtus, has been communicated by Tarnier (*Annal. Gynéc.*, xii., p. 81); I can add an additional one, hitherto unpublished, in which the fœtus was saved². Thus medical literature records 30 instances in which Cæsarian section has been performed on account of fibroid tumour of the uterus, as a result of which operations only 4 women have been saved, and 16 children (some of them premature) delivered alive³. These figures clearly show the danger of an operation which is undertaken under these indications. The risks mainly arise from

¹ The cases added by Netzel and Cazin, were noticed in the 1st edition of this text book.

² The case was that of a woman, æt. 39, who had been married 11 years, and who was said to have aborted soon after marriage, at the 4th month. Since 1873 she had been treated for fibroids, which at that time were still small and arranged round about the uterus. In the spring of 1876, they began to grow rapidly, and before long it was discovered that the woman was pregnant; at the same time symptoms of chronic bronchitis in the right upper lobe of the lung set in. I first saw the woman in December, 1876. She was then near the end of her pregnancy, the fœtus was alive, her abdomen very much enlarged. Her uterus was surrounded by fibroid nodules on its right side and also high up on its left, the uterine cavity being displaced forwards and to the left. The pelvic cavity was filled up by a large tumour advancing from the right side and behind, and extending down to the pelvic outlet; the portio vaginae stood over the left anterior edge of the pelvis, the pelvic portion of the tumour was entirely immovable.

During labour (which came on at the right time) the tumour was forced further down, and prevented any access to the uterine cavity through the pelvis. Seeing therefore that natural delivery was an impossibility, I performed Cæsarian section, the membranes being still entire. The uterus could not be separated in the least degree from the mass of the tumour, nor did it contract at all, when incised; the hæmorrhage from the cut surface was enormous, although a great number of sutures at last arrested it. The delivered woman died from exhaustion immediately after the operation. The child was saved.

³ I omit Storer's case (Lixby, *Journal of the Gyn. Soc. of Boston*, i., 1869, p. 223), since it was greatly complicated by the fact that the uterus as well as the fibroid were extirpated, after the dead fœtus had been extracted.

hæmorrhage and the collapse consequent upon the operation, in a less degree from peritonitis.

(2) *Polypi of the Uterus.*

§ 597. Polypi of the uterus only interfere with the progress of labour, when they lie by the side, or in front, of the presenting part of the fœtus, when they have attained a certain size, and are less soft and yielding than usual. In the majority of cases the mechanical difficulty which they cause, is not great. Still it may be so; everything depends on the mobility, size, and softness of the polypus, and on the accessibility of its base. When the tumour is driven down in front of the child, the pedicle, if thin, may be torn off, and the tumour be expelled spontaneously. And it is well to imitate this course of events, whenever the narrow portion of the tumour can be reached, by dividing it with the *écraseur* or scissors; hæmorrhage need not be feared. If however the great bulk of the growth lies by the side of the presenting part, in, or above, the brim of the pelvis, an attempt should be made to push it up, and to keep it back till the advancing child prevents its renewed descent. If the lower end of the child and the tumour are firmly impacted side by side, the latter must always be extirpated before the former is extracted, especially before it is perforated. This course is all the more desirable, since the polypus will in any case need subsequent removal. The extirpation may, if necessary, be done at intervals and bit by bit. Occasionally a case is so complicated, as regards diagnosis or for other reasons, that perforation of the child is called for.

It is very desirable to remove all polypi *soon after delivery*, even those which are only then discovered and found accessible, not only because they predispose to hæmorrhage, but because they are apt to slough and set up metritis &c., as a result of the injury they have suffered during labour; and lastly because their extirpation is now easy.

(3) *Enlargement of the Anterior Lip of the Cervix.*

§ 598. A much swollen or hypertrophied cervical lip may give rise to the same kind of difficulty as does a polypus lying in front of the child. The cases in which the enlargement is due to venous engorgement and (in rare instances) to extravasation

taking place during labour, have been already referred to in § 509. The proper treatment is to hold back the lip during the "pains", and to push it up between the head and the pelvic wall during the intervals. It may even be necessary to scarify the lip, or to apply the forceps, when the pelvis allows it; removal of the lip can scarcely be required.

It is otherwise however with *true hypertrophy*. This may (although it rarely does so), when the lip forms a large polypoid tumour, present such obstruction to delivery that even perforation becomes necessary, as is shown by a case which occurred in the Maternity here (*cf.* Elstner *l.c.*). Under such circumstances however, it is a better plan to remove the swelling during labour, the operation being always done by bloodless methods, owing to the numerous arteries, which run in the polypoid enlargement of the lip, and to the resulting danger of copious hæmorrhage. Still, the necessary appliances are not always at hand in the hurry of practice, so that it may be as justifiable to perforate the foetus in these cases, as with intra-vaginal myomata. Where the mechanical disproportions are less great, one of the milder proceedings (*e.g.* reposition) that have been recommended where the enlargement is acute, will suffice.

(4) *Cancer of the Cervix.*

§ 599. The difficulties which cancer of the cervix causes during labour, depend entirely on the longitudinal and peripheral extent of the disease.

(a.) *If the disease is limited to the lips, and has left their corners unaffected*, so that some uninjured and dilatable portions still remain within the circumference of the os, labour may be free from difficulty, and the stages of dilatation and expulsion pass off smoothly¹.

§ 600. (b.) *If however the entire circumference of the os, i.e. the whole portio, is involved*, the upper and largest part of the cervix will be opened up and stretched, while the diseased ring offers obstinate resistance. True, that ring sometimes widens under the pressure of the foetus, but it does not do so sufficiently; it is broken through and destroyed, or else (as is most common)

¹ This happened in the case mentioned in § 299 (note), which in my paper "*Ueber die Amputation des Scheidentheiles*" (*Archiv f. Gyn.*, v., p. 411) stands as No. 15; also in a case I have recently observed, and which is similarly mentioned in § 299.

parturient activity is paralysed and metritis develops. Under such circumstances any bulky masses which project into the vagina (especially papillomata) may be removed, and a cautious attempt made to expand the vagina by india-rubber bags, in order to test their dilating effect on the cervix. But actual incisions into the infiltrated tissues are generally required, their depth and number varying with the extent of the latter. Even these however do not always make room enough, or else the expulsive activity is insufficient to force the child through the dilated ring. Artificial assistance must then be given; where the child is living, by *forceps extraction*; where dead, by *perforation* and the use of the *cranioclast*. Whatever be the way in which the fœtus passes through, it is only in rare cases and when the infiltration is but little extensive (as in the case recorded by me in *Monatschrift f. Geburtsk.*, xi.), that its expulsion takes place without further injury to the diseased parts. As a rule the damage done is very severe, and the subsequent sloughing accelerates the fatal issue of the cancer, quite apart from the risk of puerperal septicæmia consequent upon the absorption of the products of disintegration. Moreover the incisions may tear further, so that inasmuch as it is impossible to tell beforehand how far they will do so, the spontaneous and the artificial passage of the child through the diseased ring must be continuously supervised by the hand, in order to obviate such rupture¹. Even when the disease is limited to the portio, it may be necessary to perforate a living child; this is especially so, when the head is very large, when the diseased lips are glued to the vaginal wall, and when an incision seems quite out of the question, on account of the risk of opening the bladder or the peritoneal cavity. Indeed the desirability of Cæsarian section is worthy of consideration, based on the principle that it is right to make every effort to save the child, where the life of the mother is in so very precarious a condition.

¹ In two labours which I terminated by the help of the forceps (although with difficulty), all three incisions which I made (one anterior and two lateral) extended (by further tearing) so far into the healthy tissues, that the diseased parts, that separated them, hung down into the vagina as long, thick flaps. The lying-in period passed off well, but sloughing and increased cancerous infiltration rapidly followed. The patient was transferred into the hospital in a miserable condition, her child, which was still living at the beginning of the extraction, was born deeply asphyxiated, and soon died. The other patient left the Maternity in a tolerably satisfactory state but her fœtus also died during delivery.

§ 601. (c.) *The disease may extend as far as, and even above, the internal os, and either all round, or over the greatest part of the circumference of, the neck. Under such circumstances the cervix forms a totally undilatable canal, which can only widen, if its wall is at the same time lacerated. Incisions of course must not be thought of, assuming that the fœtus is mature or nearly so; for they would obviously have to be carried through the whole thickness of the wall in order to be of any use, and this would involve injury to the peritoneum and pelvic connective tissue; moreover the delivery of the fœtus with, or without, an incision always causes dangerous laceration of the lower uterine segment. I made this sad experience in a case published by Dieterich (l. c.), in which the fœtus was not even mature. Our choice therefore lies between perforation and Cæsarian section; and if we remember that the damage to the diseased parturient passages that accompanies the performance of perforation and extraction, is hardly less than that caused by the delivery of a non-perforated child (for an illustration of this, the second case mentioned by Dieterich may be referred to, in which, although the mutilated fœtus was immature and macerated, death occurred within 18 hours after delivery), no hesitation can be felt in regarding Cæsarian section as the only correct proceeding. Practically, delivery *per vias naturales* is impossible in this condition. Cæsarian section is not more dangerous to the mother than other modes of delivery, perhaps even less so, while it alone is capable of yielding an uninjured child. Several operations are on record in which both parties concerned were saved, and in many cases a healthy child has been rescued¹. The objection that the children are already endangered by their having inherited the cachexia of the mother, is not valid, since such heredity is totally unproved. Under some circumstances it will be possible during the operation to remove the uterus together with the diseased cervix.*

Our remarks in regard to cancer of the cervix, hold good for *cancer of the vagina*. The latter is usually merely associated with the former; only in very rare cases is it an independent affection².

¹ This happened in my case of Cæsarian section (Schäfer, l. c.), as well as in those performed by Zweifel (*Arch. f. Gyn.*, x, p. 405), Bechmann (*Berliner Klin. Wochenschrift*, 1877, p. 293), and Braxton Hicks (*Obstetrical Transactions of London*, xx, p. 106).

² Cf. Welponer, *Wiener Med. Presse*, No. 24, 1880.

(5) Ovarian Tumours.

§ 602. We have already shown that the danger associated with ovarian tumours during pregnancy, is by no means slight, and the same is true, perhaps in a still higher degree, of the disorders they lead to during labour. Amongst 57 cases of this complication of labour which Playfair collected, 13 (or nearly 1 in 4) ended fatally. *The danger arises on the one hand from the obstruction to labour, on the other from the injuries to which the tumour is exposed.*

In reference to the first, and also although to a less degree in reference to the second, point, everything depends on the size, consistence, position and mobility of the tumour. If the latter is so displaceable, that the presenting part of the foetus can push it to one side, or if the tumour is already situated in the abdomen during pregnancy, and cannot again descend into the pelvis by the side of the enlarged uterus, no great difficulty need be caused by its presence; or at most may the period of expulsion be somewhat retarded. If however the tumour occupies the pelvic cavity, and cannot be pushed up above the brim, if moreover it is firm and hard, the foetus will meet with severe, frequently insuperable, obstruction to its progress. It is for this reason that small growths may be of far greater importance than very bulky ones, and they possess such importance all the more frequently, owing to the fact that they are more often immovable in the pelvis than are the latter, and that (in consequence of their concealed position in the pelvis) they are generally only diagnosed during labour, so that the steps which were recommended in § 302 in view of this complication, cannot be undertaken.

The compression and traction to which the tumour is exposed during the "pains", together with the strangulation or at any rate extreme compression to which the pedicle is liable, not rarely cause the tumour to become bruised, thrombosed and to slough; further, its walls may give way and discharge the contents into the peritoneal cavity, the newly formed adhesions being at the same time torn. Indeed these are mainly the conditions which lead to the lamentable issue referred to above. Still it must be borne in mind that those sequelae may also set in, where the mechanical obstruction to labour was of no great severity, or was entirely absent.

§ 608. Under these circumstances, expectant treatment is not advisable; at any rate it should not be pursued too long, even where a chance of spontaneous delivery is left. Amongst Playfair's 19 cases in which nothing was done, 6 mothers died; while in 14 in which the tumour was either replaced (5) or punctured (9), not one died, and 9 children were born alive. The best plan is in every case, and at an early period, to seek to *replace the tumour, i.e. to push it up above the pelvic brim*. But for this plan to succeed, the tumour must of course not be fixed in the pelvic cavity, and further must not be allowed to fall back into the latter during the "pains"; the operator must therefore either push it very far up, or else bring the presenting part well down into the pelvic brim. At any rate every effort to effect such reposition must be made, and persevered with (if necessary after putting the woman under chloroform) both during the pains and during the intervals, the success of the attempt being closely watched.

If reposition is found impossible, *the tumour must, if cystic, be punctured*. Indeed the operator need not be deterred from such a course, even when it appears to be of a solid character; for in the first place, cystic tumours may become so tense through pressure as to resemble solid ones, and secondly, apparently solid growths frequently contain considerable quantities of fluid in their interior. The best site for puncture is as a rule the bulging posterior vaginal wall, and the best moment is during a "pain", since the tumour is then most prominent and tense. If puncture through the abdominal walls appears preferable, if the solid parts of a cyst are in the pelvis, the former situation should of course be selected. An exploring trocar of moderate thickness should always be chosen, a large one only when the contents are acrid (*scharf*) and thick, or are suspected to be so; if necessary, the aspirator may be resorted to. Playfair recommends that small cysts be punctured, even when they do not cause any considerable obstruction; and it is well to bear this recommendation in mind, in view of the injuries which are frequently produced by labour, and of their sequelæ. If the puncture has not provided sufficient room, further attempts at reposition should be made; the latter frequently will succeed after tapping. If the pelvic portion of the tumour is multilocular, a wide *incision* into it may be useful, but this

requires great care, since it is often followed by suppuration of the growth.

If however neither the attempts at reposition nor the puncture improve matters, or if the latter is from the very first impracticable, owing to the solid nature of the tumour, *ovariotomy* may be performed, provided the conditions are favourable. But this operation will always be far more dangerous during labour than during pregnancy, since it makes great demands on the strength of the parturient woman, and since the abdominal incision interferes with the action of the expulsive forces. I do not think therefore that extirpation will be the method decided upon. A wiser plan will be to regard the obstacle to natural labour as an insuperable one, and to select that mode of delivery which the existing state of things points out as the best (forceps, version, perforation). It is obvious that even *Cæsarian section* may be required, and it has several times been performed on account of ovarian tumours, although unsuccessfully¹.

As exceptional occurrences I may here add the two cases published by Berry (*London Obstet. Transactions*, vii., p. 263) and Luschka (*Monatschrift f. Gyn.*, xxvii., p. 267), in which, after labour had been terminated with the help of the forceps, the cystic ovary prolapsed out of the external genitals through a tear in the posterior vaginal wall. The tumour was removed by ligature on the 2nd and 3rd days after labour respectively; Berry's patient recovered. Similar to the above was Brewer's case (*British Med. Journal*, Aug. 31, 1878), in which the cyst emptied itself, and the cystic wall became gradually exfoliated through a rent in the posterior vaginal wall, which had been produced during labour.

(6) *Vaginal Hernia.*

§ 604. Vaginal hernia is a condition in which one or other vaginal wall forms a diverticulum and then a swelling, which forces itself down to, and even beyond, the vulva, and may contain either a portion of the bladder or rectum, or loops of large or small intestine, omentum, or even some exuded fluid and blood. It occasionally leads to difficulty during labour, especially when the contents are intestinal, and when the space between the descending child and the pelvis is so much encroached upon, that the bowel is incarcerated. *Vaginal enterocele* is therefore the most important variety of vaginal hernia.

It is easy to see how some coils of intestine may occupy

¹ Kob, *Berliner Beiträge*, ii., 1873, *Sitzungsbericht*, p. 99; Kleinwachter, *Archiv f. Gyn.*, iv., p. 171; Lohs, *Deutsche Med. Wochenschrift*, No. 5, 1876.

Douglas' pouch and descend for a considerable distance, if we remember the frequent elongation which occurs in that region (especially in multiparæ), and which is usually due to prolapse of the upper portion of the vagina, and to retroflexion of the uterus; moreover an abnormally long mesentery tends to favour the displacement, and to make it permanent. Hence this form of enterocele is almost always found at the *posterior vaginal wall*; *very rarely does a hernia descend between the uterus and the bladder*, this being due to the different disposition of the serous membrane on the anterior surface of the former. The contents of the vaginal hernia are usually formed by loops of small intestine, rarely by loops of the large. At other times however it may contain the middle portion of the rectum and a bit of the sigmoid flexure, owing to the fact that occasionally the peritoneum entirely surrounds that portion of the rectum, and enables it, provided with a long mesentery and forming a loop with the help of the Roman S (*cf.* § 47), to hang down into Douglas' pouch.

§ 605. A vaginal hernia does not cause more trouble during pregnancy than at other times, indeed it is often rectified as the uterus enlarges. Parturition on the other hand may be considerably impeded by the tumour which is produced by the hernia, while even serious dangers may arise from the compression to which the contents of the hernia are exposed by the advancing fetus.

The *diagnosis* is generally easy. The tumour will be found roundish, soft, elastic, and easy to replace; the regurgitation of the contents, which is perceived when the mass is manipulated, decides the matter. In case of necessity a thorough examination *per rectum* will clear up any difficulty, and at the same time effect reposition. The latter is called for in every case of this kind, and, all bearing down having been forbidden, is to be effected during the interval between two "pains", in difficult cases under chloroform anæsthesia. If it does not succeed *per vaginam* in the dorsal or lateral posture, an attempt should be made in the genu-pectoral position, provided the head is not already too tightly fixed in the pelvis; where the latter method is no longer available, the finger should be introduced into the rectum, and liberate the impacted loop of intestine, while the other hand co-operates from without and *per vaginam*; the bowel must then be pushed back into the abdominal cavity by

the side of the promontory. A recurrence of the prolapse after reduction need not be feared, since the uterus *sc.* *fœtus* will be firmly adapted to the brim of the pelvis, and block up the way. If however reposition is found totally impracticable, and the hernia interferes with the progress of labour, or if signs of incarceration appear, delivery must be rapidly completed, either with the forceps or the hand.

(7) *Dystocia caused by the Bladder.*

§ 606. The bladder may obstruct delivery by its over-distention, and by the presence of a vaginal cystocele or of a calculus.

Retention of urine is not rare. When prolonged, it may prevent the presenting part of the child from engaging in the usual manner, by forcing the axis of the uterus out of its normal direction, and further interfere with the action of the "pains", by altering the natural shape of the uterus and disturbing the bearing down mechanism (*cf.* § 449). The diagnosis of this condition will be easy, if the practitioner makes a point of inquiring into the state of the bladder at every visit, and attends to its evacuation, when necessary. Undue distention will readily be recognised by the shape of the lower abdomen, where the bladder forms a small circumscribed tumour at the side of the uterus, and also by palpation. It is sometimes difficult to pass in the catheter, when the upper portion of the urethra is pressed upon by the presenting part of the child; nevertheless the introduction will generally succeed, if the *fœtus* is a little raised (*per vaginam*) at the same time that the instrument is being pushed in the direction of the bladder. The knee-elbow position may assist the proceeding. Occasionally however when the head lies very low, it may be quite impossible to pass the catheter. A metallic instrument is more useful than an elastic one.

§ 607. *Cystocele* is frequently associated with prolapse of the anterior vaginal wall. If the diverticulum is full, it forms a tense tumour, which projects into the vagina, and may sometimes descend a long way. Indeed under some circumstances it may fill up the pelvis, to such an extent as to block the way to the os; there will then be considerable irritation and pain in the bladder. The careful accoucheur will readily recognise this abnormality; still the most serious instances of malpractice have

occurred under such circumstances: the swelling has been mistaken for a hydrocephalic skull (Mazzoni), or for the bag of membranes (Hamilton), and the bladder opened in consequence! Such mistakes will be avoided, if at every examination and before every operation, the condition of the bladder is ascertained. A straight catheter cannot adapt itself to the changed position of the bladder, so that a male one should always be used on these occasions; it is introduced with the point directed forwards, until this has passed the internal opening of the urethra, when the point is to be rapidly rotated backwards and downwards into the diverticulum. Frequently the genu-pectoral position facilitates this manœuvre. As regards the dangers associated with a cystocele that has been emptied, and their treatment, the remarks made in § 280 about prolapse of the anterior vaginal wall hold good.

§ 608. *Vesical calculi* are amongst the rarest complications of the puerperal state; indeed they are always uncommon in women. During pregnancy it is quite the exception for them to cause trouble, although a number of cases are on record in which a calculus has been removed by operation during that state. During labour such a calculus may, if situated in the lower division of the bladder, be pressed by the head against the anterior pelvic wall, and be so fixed in that situation, that it projects into the pelvic canal, and, when sufficiently large, constitutes a serious obstacle to delivery. Stones of moderate size have occasionally been spontaneously expelled by the pressure of the child and of the pains. The condition is most serious, when a large calculus lies in a cystocele, or is incarcerated in the upper opening of the urethra; for here, apart from the consequent obstruction to delivery, the danger of the bladder being injured and bruised has to be considered.

The diagnosis will be easy, when the position of the hard, circumscribed tumour shows that it can hardly belong to the pelvis, and when the mass is immovable during the intervals between the pains. Under contrary conditions however the diagnosis may be very difficult, and the tumour be mistaken for an exostosis¹.

If the calculus is discovered before its impaction, the

¹ Cf. the interesting case published by Cohn, *Berliner Klin. Wochenschrift*, 1884, p. 396.

accoucheur should push it up *per vaginam*, and also with the catheter *per urethram*, or it may be displaced to one side and, if possible, kept back above the brim during the pains, until the head has advanced far enough to prevent the stone from again descending. Sometimes this may also be done after the stone is fixed, by forcing up the head, or by using the knee-elbow posture. If the calculus is hopelessly impacted, and there is risk of the descending head injuring the intervening wall of the bladder, the stone may, if not too large, be extracted *per urethram* after the rapid dilatation of the latter; if very large, it may be removed by colpotomy, the incision being carried directly down upon the impacted stone (in a vertical direction, so as to avoid the ureters). The wound must be sewn up immediately after delivery. Although lithotomy is somewhat more dangerous in these than in non-puerperal cases (owing to the risk of the edges of the wound ulcerating, or of pyæmia), yet it is preferable to lithotritry; the latter is here much more difficult and injurious. Many of the unfavourable results of colpo-cystotomy performed during pregnancy and labour are however entirely due to complications of the urinary organs, which had already existed a long time.

§ 609. The tumours, which have been mentioned in the previous paragraphs, are those which most often interfere with delivery. But there are other new formations of the generative organs, tumours which originate from their vicinity (*e.g.* from the serosa or the pelvic connective tissue), and also such as arise in the more distant abdominal organs, that may, if they project into the pelvis, lead to much the same kind of difficulty. Clinical medicine records a considerable number of such cases¹. There would be no special advantage in here entering fully into these most various occurrences. The treatment is entirely similar to that which has been recommended above for uterine and ovarian tumours. The first object should always be to push the obstacle aside, or else to return it to its place; if that is impossible, then to diminish its size, or to remove it from its

¹ Thus in my hospital practice a multiple hydatid cyst of the peritoneum and omentum has necessitated perforation of the skull, even after the intra-pelvic tumours had been punctured from the rectum and vagina. (*Cf.* Wiener, *Archiv. f. Gynäkologie*, vol. xi., where further cases are referred to). Hausmann, *ibid.*, xii., p. 163; Kirschsteiner (*Beitrag z. Casuistik der Beckengeschwülste, Dissertation*, Zurich, 1863) and Kaltenbach (*Zeitschrift f. Geb. u. Gyn.*, iv., p. 191) have been obliged to perform Casarian section, on account of carcinoma of the rectum.

position in front of the child. If this too is impracticable, and if the practitioner feels sure from the very first that he can save the mother by perforating the foetus, the latter course should be adopted. If he is not sure of saving the mother, and delivery *per vias naturales* is out of the question, Cæsarian section must be substituted, the case being treated, as if there existed a corresponding degree of pelvic contraction.

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(*cf.* also the Literature referred to on pp. 417, 418 in Vol. i.)

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4. *Anomalies of the Fætus and its Appendages.*

a. Abnormal Size and Conformation.

(1) *Excessive Development of the Fœtus.*

§ 610. The development of the fœtus is rarely so excessive as to cause serious interference with labour, provided that the pelvic cavity is normal, and supposing of course that the various parts of the fœtus are in proportion to one another. The weight rarely exceeds grm. 4,000 (lb. $8\frac{1}{2}$ *avoir.*), and very exceptionally does so to any considerable extent. The accounts of children weighing 5,000 grm. (lb. 11) and over, are as a rule only to be believed with the greatest circumspection. Such cases however undoubtedly may occur; for instance A. Martin describes a boy who weighed 7,470 grm. = ca. lb. $16\frac{1}{2}$ (*Berliner Klin. Wochenschrift*, 1876, p. 469), without either brain or calvarium. Further instances are given above (§ 104 note).

These large fœtuses (*giant fœtuses*) of course have proportionately large heads; nevertheless these latter as a rule admit of considerable moulding, inasmuch as the sutures and fontanelles are generally wide, and the bones flexible. Hence although the course of labour is apt to be somewhat retarded, it is not greatly obstructed. These remarks however no longer apply when the ossification of the cranial bones has advanced very far, or when the upper limit of average development is greatly overstepped. The plastic changes will then be insufficient to overcome the disproportion between the head and the pelvis. Labour is impeded very much as with a generally and uniformly contracted pelvis, and the difficulty may be enormous, unless the pelvis itself happens also to be unusually wide. Treatment must depend on the degree of disproportion.

We have mentioned in § 104 the various conditions that affect the development in size of the fœtus. The diagnosis can as a rule (provided the liquor amnii is scanty) be easily made from the size of the uterus, from the size of the fœtal parts that are felt, and from the length of the fœtus (*cf.* § 133). It is however all but impossible accurately to determine the dimensions of the head. The size of the cranial bones that can be palpated, the length of the sagittal suture, whose extremities can occa-

sionally be reached, and the degree to which the pelvic cavity is filled up are the most reliable *points d'appui*.

§ 611. *Unusually broad shoulders and a capacious chest* are generally associated with too large a head, but I have once or twice seen them without the latter. They may prevent the trunk from *entering*, as well as from *leaving*, the pelvis. In the former case (as is not uncommonly seen in contracted pelves, even where the shoulders are of average size) they also hinder the exit of the head, since it is only where the pelvis is very shallow that the head can be delivered, while the shoulders are still detained at the pelvic brim. With such a shallow pelvis moreover, the life of the child is extremely imperilled by the pressure on the thorax and umbilical cord, and by the hindrance to respiration; the mother too runs a risk of her perinæum being torn, even after delivery of the head. Further, unusually broad shoulders may render version very difficult, and with pelvic presentations delay the extraction of the fœtus to a fatal extent.

The condition in which *the shoulders are prevented from entering the pelvis*, is sometimes difficult to diagnose, and it is one which is especially apt to be confused with obstruction caused "by a cord that is coiled round the fœtus, or is unduly short." In such a case it is best to exert a steady pressure above the anterior pelvic wall in a backward and downward direction, and thus to force the shoulders forwards, while the head is gradually pulled with the forceps. When this plan is not successful, the child, if still alive, will probably always perish, since its head (which is still at the outlet) prevents the hand of the accoucheur from reaching the shoulders; nor do the lateral incisions of the vulva which have been recommended provide sufficient room. Under such circumstances the proper course is either to extract the head by pulling vigorously on the neck, or, if this does not succeed, to perforate the head, so as to reach the arms and bring them down. This proceeding will diminish the circumference of the chest, and give more control over the extraction. The same plan should be adopted, when, after delivery of the head, the shoulders remain immovable *in the pelvic cavity*. But under all these conditions it may be necessary to resort to blunt hooks, or to perforate the thorax, or even to proceed to evisceration, or to crush the child with the cephalothractor.

§ 612. *If the shoulders remain stuck in the lowest portion of the pelvis, i.e. in the outlet, the practitioner should proceed in the manner directed in § 195, so as to imitate the natural mechanism of delivery of the trunk. In the first place any coils of the cord, that surround the neck and thorax, should be loosened, and pressure applied alternately to the dorsal side of the posterior and to the ventral side of the anterior shoulder: or else the index finger may be passed into the axilla, with the object of bringing the binacromial diameter into the sagittal diameter of the outlet. Next, by careful traction on the neck the anterior shoulder may be brought beneath the inferior arciform ligament, so that the humerus rests behind the symphysis. The trunk should now be extracted by traction at the posterior axilla, while it is strongly flexed towards the anterior pelvic wall. If the pelvic cavity is greatly contracted, it may be a good plan to begin by forcing the anterior shoulder (which is lying behind the symphysis) up above the latter, which proceeding will bring the neck into the pubic arch. By this means room will be obtained for acting on the posterior shoulder, which may now be drawn down to the anterior edge of the perinæum, after which the anterior shoulder may be liberated, by pushing back the trunk towards the perinæum. Incisions into the latter, if it is not already torn, may also be of use, especially as it is always greatly imperilled by the extraction. Again, such a rotation of the trunk as will bring the anterior arm to one side or even round to the back, occasionally greatly facilitates the extraction, but such rotation is rarely possible, when once the trunk is firmly impacted. Sometimes too the introduction of a blunt hook into one or both axilla is of great value, but care must be taken not to act directly on the humerus, lest it, or its epiphysis, should give way. On the other hand the actual dragging out or "liberation" of the arms is not to be recommended, owing to the danger of injuring the joints and bones. Where there is sufficient room for the manœuvres, the extraction in the way just described will also be found possible. Of course when the fœtus is dead, all considerations in regard to it are at an end, and such method of extraction should be selected as is most rapid and least painful for the mother.*

(2) *Enlargement due to Dropsy and Emphysema.*

§ 613. In rare cases the excessive size of the *whole* foetal body is caused by œdema of the skin, or by emphysema; and the increase in size is especially great, if (as usually happens) the large cavities of the body are at the same time distended with serum or gas.

Anasarca of the foetus may either occur independently, or in association with œdema of the placenta, or co-exist with the same affection in the mother. There are various causes, the commonest being anomalies of the cardiac orifices, or circulatory disorders in the umbilical vein. It is an open question how far inherited syphilis is at the bottom of the disease, but at any rate it was present in the few instances which I have come across (hepatic syphilis, osteo-chondritis syph.). The infiltration generally consists of pure serum, but occasionally there is at the same time hyperplasia of the skin and subcutaneous connective tissue, as in the cases observed by Betschler. Moreover the thickening may arise from true elephantiasis, and has been described by Steinwirker (*l. c. sub Literature*) under the name of elephantiasis congenita cystica.

The obstruction to delivery may be considerable, and arises partly from the large size of the foetus, partly from the friability of its extremely tense, infiltrated skin and subjacent tissues, which do not allow of any forcible manipulations being made for the purpose of extraction. Since the foetuses in question are either already dead, or, if still alive, perish soon after labour, it is always a good plan, whenever there is any difficulty, not to attempt to extract by the hand, but at once to resort to instruments, either the forceps or hook, or the cephalothryptor applied to the trunk, the dropsical cavities of the body having, when necessary, been previously opened with scissors or a sharp hook, and thus diminished in size. Deep incisions into the skin may be of use.

§ 614. *Emphysematous enlargement* may be caused by decomposition, when air gains access to a foetus, which has died during, or a short time before, delivery, and when such a foetus remains in the uterus for a length of time after the escape of the amniotic fluid. The condition therefore most often accompanies a difficult protracted labour, which has necessitated numerous intra-uterine

and intra-uterine manipulations. The gases develop both in the tissues of the fœtus and in its cavities. If the whole body is affected, it appears inflated; the skin is full and tense, and crepitates, when pressed by the finger; all the limbs are more bulky than usual, the trunk is enlarged, and the soft parts collapse, if punctured or incised.

The circumference of the body may be very considerable, and constitute a mechanical obstacle to delivery. This however, owing to the slight resistance that is offered by decomposed soft parts, would generally be overcome by the expelling forces, were these not exhausted by the decomposition which has taken place in the uterus, and by the preceding parturient efforts. It is obviously desirable to remove the fœtus as rapidly as possible, but the necessary operation is rendered difficult and unpleasant by the infiltrated and rotten condition of the parts. The accoucheur should therefore seize the fœtus in such a manner as to get a firm hold, so that he may avoid tearing off the limbs &c., introducing his hand repeatedly into the already diseased generative parts, and thus unnecessarily irritating, injuring and infecting them. The best plan is to seize the body with the cephalothryptor, after emptying the thoracic and abdominal cavity of any contained gases, if necessary by puncture. When the above instrument is not available, it may be well to puncture the cavities of the body, and to extract the fœtus, including the trunk, with the forceps or sharp hook.

§ 615. I must mention here that *cadaveric rigidity of the fœtus* may (although not to any great extent) impede and hinder delivery, owing to the unyielding condition of the whole body and especially of the limbs, as is shown by the instances related by Curtze¹. This form of rigidity is undoubtedly extremely rare, indeed so rare that Schwartz (*Die vorzeitigen Athembewegungen*, p. 230, note) entirely denies its occurrence. But it has been seen by several observers²; and Martin met with it in a fœtus, that had been removed *post mortem* from an intact ovum (*l. c.* p. 55).

¹ *Zeitschrift f. Med. Chir. und Geburtshülfe*, v., 1856.

² Schultze (*Deutsche Klinik*, No. 41, 1857); Haake (*cf. sub Curtze*); Ehrmann (Schmidt's *Jahrbuch*, vol. 58, p. 83); Bartelsen (*cf. Kussmaul, Prager Vierteljahrschrift*, 1856, ii., p. 67); Grigg (*British Med. Journal*, Oct., 1874, p. 493); Schröder, Martin (*l. c.*).

(3) *Circumscribed Enlargement of the Fœtus.*

§ 616. The enlargement of isolated regions is a commoner cause of dystocia than is general increase in the size of the fœtus. It either arises from the distention of one of the great cavities of the body by a serous effusion, or from enlargement of the viscera, or from the presence of tumours. The most important of these abnormalities is

(a). *Hydrocephalus.*

§ 617. This is a rare cause of difficult labour (ca. 1 : 3,000; 15 times out of 43,545 labours, according to Lachapelle), but it may cause an enormous distention of the cranial cavity; indeed the circumference of the head not uncommonly measures 65—80 cm. (25—30 in.).

The *diagnosis* is not difficult, when the cranial bones are very movable, for the skull is then more like a loose sac filled with fluid than like a solid body. When the head is lying in, or above, the brim of the pelvis, the skin covering it will be felt to be tense during the pains, but loose during the intervals, and through it the sharp radiating edges of the bones can be made out. The wide gaping sutures and fontanelles constitute the most reliable and easily ascertainable sign.

These characters however are not always present. Well marked cases of hydrocephalus occur, in which the expanded sutural substance has undergone extensive ossification, and in which there is no difference in this respect from a healthy skull; or else the bones are by no means thin like paper, but strong and thick, so that the skull is neither soft nor fluctuating. Conversely, a skull is occasionally met with of normal size, in which the ossification has been so much delayed, that the sutures are as wide and patulous, as in the case of hydrocephalus. Under such circumstances the most trustworthy sign of the hydrocephalic skull is the abnormal relation between the face and the forehead, the width and prominence of the latter, the presence of an open frontal suture, and the continuation of the forehead into the small face at a marked angle. When it is impossible to palpate the head carefully, owing to its high position, or when the breech of the child presents, we are restricted for our diagnosis to the results of external palpation, and to the

indications of a very large and yielding head, although it is not always easy to make out these points. In such a dilemma the less characteristic indications, for instance the repeated birth of hydrocephalic fœtuses and monstrosities, great weakness of the fœtal movements, are worth considering. The hydrocephalic skull has been mistaken for that of a macerated fœtus, for tense membranes, for an encephalocele, spina bifida, cystic tumours, or for a presenting part of the trunk. Attention, combined, where necessary, with an exploration by the whole hand, will prevent error.

§ 618. The influence of hydrocephalus on the progress of parturition varies in different cases. Some labours pass off spontaneously, and indeed quite easily, while in others the disproportion is so great that the pains cannot, or can only with difficulty, overcome it, or else only do so at great risk to the mother. This not only depends on the degree of the enlargement, on the quantity of the fluid collected, but very much also on the characters of the head, on the degree of ossification, and further on whether the fœtus is living or dead, *i.e.* whether the intra-cranial fluid renders the skull tense or not. Further, the presentation and the way in which the fœtus engages, have an influence; if the head enters with its greatest circumference square to the brim, progress will not be so easy, as when it enters obliquely, inclines to one side, or enters strongly flexed or extended. In the latter case it is more easy for a segment of the skull to become fixed in the brim, and therefore for the head to be moulded, than it is in the former, in which the skull is merely rendered tense with the pressure of every pain, like a tense bladder, without making any progress. Pelvic presentations are therefore, generally speaking, favourable, since in them, by means of traction from below, the skull is more readily subjected to pressure from the sides of the pelvis, in consequence of which the plastic changes are more easily effected. Indeed inasmuch as the form of the hydrocephalic skull increases like a funnel towards the vertex, such a mode of passage may be the most favourable of all. These presentations moreover are, for obvious reasons, much commoner with a hydrocephalic than with a normal skull (about 1 : 5).

Thus where the conditions are favourable, the skull may be compressed by the force of the pains, and become so pointed that

it can engage in, and pass through, the pelvis. On the other hand its least resisting portion may burst, either at a suture or even through one of the bones; the fluid is then discharged and the difficulty at an end. It is not necessary for the scalp also to burst, for if only the contents of the skull are effused beneath it, the obstruction will be got rid of. Rupture and discharge of the fluid are most often seen with pelvic presentations; Depaul¹ *inter alios* (especially Englishmen) records instances, where the fluid escaped into the cellular tissue of the neck and of the chest by means of fissures, which originated through the rupture of cervical vertebræ. In another case the fluid escaped into the pleural cavity, after rupture of two thoracic vertebræ.

Spontaneous delivery however is comparatively rare. As a general rule the obstruction is so great, that interference becomes necessary in order to preserve the mother. In 77 cases collected by Hohl, and in 17 recorded by Boehr (*l. c.*) which occurred in the Berlin Maternity, this was required 63 and 10 times respectively, *i.e.* 73 times out of 94 cases. Macdonald (*l. c.*) has increased the number to 109; in 84 assistance was given. Nor is the *prognosis for the mother* altogether favourable, although this depends less on the actual frequency of operative measures than on the fact that they are not infrequently undertaken too late. This also explains why we comparatively often hear of *rupture of the uterus*; the great expansion, to which its lower segment is exposed by the bulky head, which will not engage in the pelvis, must cause that segment to tear comparatively early. Amongst the 94 cases collected by Hohl and Boehr, at least 24 (*i.e.* 1 in 4) terminated unfavourably, and in many of those collected by Hohl the result is not given. In the higher degrees of the disease, the *child* is almost always lost, owing to the great protraction of the labour and to the operative measures, even when it was alive at the commencement of delivery. This however is no great misfortune, since in severe forms of hydrocephalus the prospects of life are exceedingly bad.

§ 619. The rule for *treatment* in these cases also is to leave everything to the pains, provided the head adapts itself to the pelvic ring, and makes progress. But where this does not happen, early interference must be resorted to for the benefit of

¹ *Annales des Hôpitaux*, No. 17, 1873.

the mother, the life of the child being highly precarious. The occasions when the application of the forceps is desirable, will be rare, and its indications are mainly negative: the head must no longer be situated high, nor must it possess such dimensions as will prevent the instrument from gripping it; the bones must not be of parchmentlike thinness, or else they would entirely yield under the pressure of the forceps. These indications are only exceptionally present in their entirety. *Version* is only a good proceeding, when the head is still movable above the pelvis, when the pains are bad, the increase in bulk moderate, and when ossification has not made great progress. But if those conditions are present, it will, in accordance with what was mentioned in the former §, offer the best prospects of delivering an uninjured child.

In the great majority of cases however, in all the severer forms of the disease, the best plan is to lessen the skull by letting out the fluid, *i.e.* to *puncture* it either with a trocar or with the prick of a knife. The ordinary instruments for perforating, or breaking up, the head are forbidden, since puncture is as a rule sufficient for overcoming the obstruction, and is not incompatible with the survival of the fœtus. I must admit however that no reliable case is recorded in literature, in which the child continued permanently alive, so that, if after puncture the head continues to be obstructed (owing to its bulk being still too great, or owing to inefficient pains), the accoucheur must not, through excess of zeal for the life of the child, wait much longer. Version may be performed, when it is presumptively free from danger to the mother, but, generally speaking, the better plan would be to dilate the seat of puncture, and then to extract the head with the *cranioclast*. This instrument involves no risk to the mother, and takes a firmer hold on the scalp than the *cephalothryptor* can do on the non-resisting bones.

A presenting head must be punctured at the nearest point, which is thin and tense during the pains; an after-coming head through a lateral fontanelle, or, if no such is accessible, through the foramen magnum. If necessary, the hard palate may be broken through with the index finger (*Kleinwächter*), or else the puncture may be made between the spinous processes of two cervical vertebrae, after exposure of the seat of the puncture by the knife. If the opening that has been effected, is too narrow

to allow of free discharge, or if it gets blocked up, a tube should be pushed through it into the cranial cavity.

(b). *Hydrothorax and Enlargement of the Abdomen.*

§ 620. *Hydrothorax* and *ascites* are of much less importance, since it is the exception for them to be severe, and since the abdominal parietes are yielding. They may occur independently or in combination, but *ascites* is far the commoner. Uncomplicated pleural effusions are rare; Hohl has twice seen them obstruct labour, I once.

§ 621. The various causes, which may lead to enlargement of the abdomen, are the following: an accumulation of serum; the distention of the urinary organs with urine, both of the bladder¹ and of the ureters² (a result of atresia or great narrowing of the urethra); *cystic degeneration of the kidneys*³; distention of the uterus with fluid, consequent upon occlusion of the cervix⁴;

¹ Duparcque, *Annal. d'Obstétrique*, 1842.

Depaul, *Gazette hebdom.*, 1860, No. 20 &c.; also *Société de Biologie*, 1864.

Hecker, *Klinik*, i., 1861, p. 122; *Monatsschrift f. Geb.*, xviii., p. 373.

M. B. Freund, *Breslauer Beiträge*, ii., p. 240.

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Olshausen, *Archiv f. Gyn.*, ii., p. 280.

Arnold, *Virchow's Archiv*, xlvii., p. 6.

Whittaker, *American J. Obst.*, iii., p. 389.

Duncan (Carmichael's case), *Edinb. Med. Journ.*, Aug. 1870, and *Edinb. Obst. Transactions*, 1872, p. 134.

Lusk, *American J. Obstetr.*, xi., p. 781.

Comelli, *Wiener Med. Wochenschrift*, No. 37, 1879.

² Ahlfeld, *Archiv f. Gyn.*, iv., p. 161.

Gervie, *London Obst. Trans.*, vi., p. 221.

Freund, l. c.; Morris, *Medical Times*, i. 1876, p. 591.

³ Siebold, *Monatsschrift f. Geb.*, iv., p. 161.

Heusinger, *Ein Fall v. angeborener Blasenniere*, Marburg, 1862 (contains a list of published cases of cystic kidneys in the fœtus).

Virchow, *Die krankh. Geschwülste*, i., 1863, p. 270.

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Lammert, *Verh. d. Würzb. Phys. Med. Gesellschaft*, ii., 1871, p. 8.

Wilson, *Obst. J. Great Britain*, Feb., 1878, p. 753.

Gervie, *ibid.*, May, 1878, p. 92.

⁴ Gervie, *London Obst. Transactions*, v., p. 284.

Davies, *Obst. J. Great Britain*, Feb., 1877, p. 739.

tumours of the liver¹ or spleen²; a testicle that has been retained in the abdomen³; aneurysm of the aorta⁴; a condition in which one fœtus is included in the other⁵. These conditions may cause the abdomen to attain to such dimensions, that delivery is delayed, and may even be considerably obstructed; the degree will vary with the mass and consistence of the swelling. The existence of such abnormalities is not difficult to detect. The head or breech is as a rule easily born, but the trunk does not follow; an accurate examination will then reveal the state of affairs, although the anatomical diagnosis can of course only be made after delivery. The ordinary mode of extraction should always be tried first; if the trunk refuses to descend, it should then be punctured, but only broken up, if absolutely necessary. Puncture with a fine trocar must always precede embryotomy, for it is often sufficient to make the extraction possible, while where ascites or a distended bladder are the cause, the life of the child need not be inevitably lost⁶.

(c). *Tumours situated on the Surface.*

§ 622. Tumours situated on the surface of the body, do not lead to difficult labours as often as do the diseases, that have just been dealt with. In addition to true new growths, such as lipomata, which are rare, we are here especially concerned with cystic hygromata, the sac of a spina bifida, herniæ, ectopic abdominal viscera and swellings produced by parasites. The two first are the commonest kind of tumours, and they are either placed on the upper end of the vertebral column, on the nape, the neck, in the axilla; or, as most frequently happens, at the lower end of the spine in the sacral and perineal regions.

§ 623. Tumours of the sacral region, especially cystic hygromata, are the commonest cause of obstruction to delivery.

¹ Hanse, *Neue Zeitschrift f. Geb.*, xi., 1842, p. 263.

Nuggerath, *Deutsche Klinik*, 1864, No. 44.

² Petit-Mangin, *Gazette Med.*, Paris, 1883.

³ Rogers, *American J. Obstetrics*, ii., p. 626.

⁴ Phaenomenow, *Archiv f. Gyn.*, xvii., p. 133.

⁵ Joulin, *l. c.*, and *Traité d'Accouchements*, 1866, ii., p. 252.

Buhl, in Hecker's *Klinik*, i., 1861, p. 301.

⁶ Aubeus recommended the accoucheur to tap the scrotum, when ascites accompanies a pelvic presentation, in view of the fact that the vaginal process of the peritoneum is generally open (Hergott, *l. c.*).

Amongst 79 cases referred to by Braune, difficulty arose in 22; Hohl has collected 40 cases (although some of the tumours were on other parts of the body), out of which 18 required artificial assistance, while in 6 the delivery was very difficult. The fœtuses were usually of the female sex, and the presentation that of the vertex. The difficulty generally only begins after the birth of the head; its degree varies with the bulk, consistency and firmness of the tumour, and with the size of the child. Diagnosis is difficult. The possibility of a second fœtus or a double monstrosity being present, must be borne in mind, for a tense tumour may be mistaken for the bag of membranes. All the various conditions that are discovered on a careful examination, must be carefully weighed, and will lead to a decision. Treatment need not take the life of the child into much account; still an attempt should always be made to deliver the swelling entire, and only when unavoidable, should its size be lessened by puncture, incision or crushing. The ordinary extraction is often facilitated, by using the excavation of the posterior pelvic wall for the reception of the tumour; the latter should be rotated and pushed into it, a manœuvre which as a rule will not be found difficult. If the breech presents, the accoucheur should bring down the thighs, in order with their help to place the tumour in the way described.

§ 624. The *sac of a spina bifida* may reach the size of a child's head; it is generally situated on a broad base, and feels either tense and elastic, or doughy. Such a sac is very apt to be confused with the fœtal membranes, especially when it is situated at the lower end of the vertebral column in pelvic presentations, and if it is the only part that presents in the parturient canal¹. No portion of the fœtus however can be felt in the sac, as it can within the membranes, while the tumour moves, when the fœtus is displaced by external manipulations, which the bag of membranes does not do. Again, the membrane covering the sac may be felt to be continuous with the skin of the fœtus; and lastly, such a sac rarely lies as concentrically in the parturient passages as does the bag of membranes, and its consistence remains the same both during, and apart from, pains. It may be distinguished from a relaxed hydrocephalic skull, or from one in which the bones are very movable (as occurs in a fœtus

¹ Cf. *inter alios* Martin, *l. c.* ² *Obstet. Jour.* *Journal of Obstetrics*, 1878, p. 118.

that has undergone prolonged maceration), by the discovery of hairs, and by the palpation of the cranial bones. In many cases the diagnosis is greatly facilitated, by the possibility of forcing a finger into the cleft in the spinal column. If the extraction proves difficult, and the swelling does not rupture, the sac may be punctured; broadly speaking, the rules mentioned in the previous paragraphs hold good.

(4) *Monstrosities.*

§ 625. The double monsters are the only other malformations that invariably obstruct the course of labour, although in rare cases difficulty might be caused by the parasitic structures already referred to, or by the attachment of otherwise well formed individual parts of one fœtus to a well formed second fœtus, either at a situation which corresponds with those parts, or at an unnatural situation. These appendages are as a rule too small and soft to lead to any serious obstruction. Nevertheless during labour they should be very cautiously dealt with, since they are apt to rupture and tear off, and might then involve danger to the well developed fœtus. It is therefore only when indispensable, that cutting instruments should be used: moreover the region should always be borne in mind to which the appendages are most often, and according to their nature are likely to be, attached.

(a). *Double Monsters.*

§ 626. Double monsters, the result of the union of two *fairly equally and well developed twin fœtuses*, possess a greater obstetrical significance. The union exists at synonymous points, but presents numerous variations as regards extent, closeness and situation. The four varieties which are most important for the accoucheur are:

a. Cases in which two almost entirely separate bodies have grown together to a variable extent at the anterior surface either of the thorax, or of the abdomen.

b. Those in which two such bodies have become attached to each other at the dorsal surface of the sacrum, and the lower portion of the vertebral column.

c. Those in which a single trunk is provided with two separate heads.

d. Those in which the heads of separate trunks have become united, or fused into one.

These anomalies cannot be *diagnosed* at the beginning of labour; at most might a plural pregnancy in one ovum be suspected. Indeed the practitioner may be in doubt, even when further progress has been made, since the same presentations and positions, the same anomalies in the descent of the foetal parts may also occur, where divided twins are derived from a single ovum. Only when the difficulties become so great that the accoucheur has to introduce his hand into the vagina and uterus to clear them up, will the actual condition of things be discovered.

§ 627. The *course of labour* is in many respects similar to that which we described in § 209, when speaking of the simultaneous entrance into the pelvis of separate twins. But the complications and difficulties are greatly increased by the adhesion, and on the extent of the latter will the possibility of a spontaneous termination, or of interference being required, mainly depend.

Since double monsters are always derived from a *single ovum* by division of the original rudiment, the two foetuses always present with the same end of the body. *Head presentations* are the commonest. Delivery may then take place in one of the following ways. The head and shoulders of one foetus may pass out, while the other head remains with its neck resting above the anterior pelvic wall. In such a case after delivery of the first head, the corresponding trunk and lower extremities are driven through, much as in spontaneous evolution from a transverse presentation, the neck of the delivered head (lying at the lower edge of the symphysis) forming the centre of rotation. The second foetus now advances with its pelvic extremity first. This is the usual course of events, when labour occurs spontaneously, and is also the most favourable. The same sequence of events generally also occurs in the variety c., i.e. where there are two heads with a single trunk. In other cases however, especially when the neck of the second foetus is shorter than that of the first, the two heads pass through the pelvis one after the other, and are followed by the trunk. Under such circumstances the second head must be pressed into the neck of the delivered head, which neck is still in the pelvic cavity, and it is

obvious that it is only if the pelvis is very capacious, that the second head will be able to get past the neck and shoulders belonging to the first head. Hence artificial interference is generally required.

Presentation of the lower extremities is rarer, but much more favourable. The two trunks pass pretty easily, and parallel to one another, through the pelvis. The heads are born one after the other; but the posterior one, finding room in the sacral excavation, passes most easily, and therefore first; the anterior remains above the pelvis, and its neck is pressed against the symphysis by the posterior head. The rarest presentation is that of the shoulder.

The variety *d.* (united heads) is the one most rarely met with, and is also the rarest to terminate spontaneously. The two heads are delivered as a single, but very large, one would be.

The great frequency with which a labour with conjoined twins terminates spontaneously (according to Hohl it does so in 78 out of 119 cases; according to Playfair's collection in 12 out of 31 cases, =85 times out of 150 cases), explains why the prognosis is better for the mother (Playfair records but 1 fatal case amongst his 31) than might be expected from the difficulty of delivery. In part doubtless this is due to the not infrequently diminutive size of the fœtuses (as in all multiple labours), and to the but slight consideration into which, and justly under the circumstances, the life of the fœtus (already so gravely compromised by the malformation) is taken.

§ 628. In the matter of *treatment*, I strongly advise the practitioner to imitate the mechanism that has been described above, as far as he possibly can. Since the presentation of the lower limbs is the most favourable, it is *imperative*, where the head presents, to *bring down the feet*, if version can still be performed, i.e. if neither head is as yet immovably fixed in the brim. Unhappily the diagnosis can but rarely be made at a sufficiently early stage, but if it is discovered that one head is preventing the other from entering the brim, it is always well to turn; for there can then be no doubt of the existence of twins, and version will be the best possible proceeding under the supposed circumstances, even where the fœtuses are quite distinct. The abnormal union will be detected during the operation, and all four extremities should then be brought down, so as

to guard against one breech remaining hitched above the brim. The same line of treatment should be adopted, where there is a primary pelvic presentation, if the malformation has been discovered in good time, or has been revealed by the difficulty of getting down the second breech. During the *extraction* it is well, in order to gain room, to try to bring the trunks into the oblique diameters of the pelvis, since this may possibly prevent the heads hitching above the promontory or anterior pelvic wall. It is sometimes possible to induce the posterior head to enter the pelvis first, *i.e.* to pass into the sacral concavity, by well raising the delivered trunks towards the abdomen of the mother : this manœuvre causes the other head to move forwards and upwards over the brim of the pelvis, and consequently to be retarded.

If with a vertex presentation the first head is born, and the second remains above the pelvis, both fetuses should still be turned, all the feet being brought down, and the second head being delivered last. If this is impossible, it will be necessary to perform *evisceration*. Amputation of the delivered head is not good, for it does not help matters in the least, while *evisceration* affords access to the feet. If the second head has advanced into the pelvis after the delivered one, and cannot get further, an attempt may be made to extract it with the *forceps* ; if without success, *perforation* should be resorted to. The same course should be pursued, if the presenting head will not advance and pass out ; if possible, extract with the *forceps* ; as a last resource, perforate. It will sometimes be found practicable to bring down the feet, after delivering the perforated head.

If these rules are followed, it will not often be necessary to mutilate the *fetuses* to any considerable extent. But it is obvious that it may occasionally be necessary to break up both the trunk and the neck, whether the feet or the head present. The practitioner should always so long as possible act as if no malformation existed ; on the other hand he need dread mutilation all the less, provided it is for the good of the mother, inasmuch as the *fetuses* are usually incapable of any prolonged existence. For the same reason *Cæsarian* section is quite out of the question, even when the *fetuses* are alive ; it would not be right to risk the life of the mother, considering how problematical is the preservation of her offspring. In quite exceptional cases the *adhesion* between the two *fetuses* can be

entirely divided¹ within the parturient passages. But such a proceeding has no special advantage, since it kills the fœtuses; while where the point of union can be reached, it will also be possible to carry out podalic version.

(b) *Other Monstrosities.*

Lastly, I must mention some very rare and abnormal forms of fœtus, which may lead to dystocia:—

§ 629. *Anencephalic* or *hemicephalic monsters* have a small, usually immovable head which, owing to the partial or complete absence of a neck, is placed between the shoulders; the latter are generally very broad. The liquor amnii is very abundant. Every variety of presentation may be met with, but that of the pelvic extremity and transverse presentations preponderate; in the higher degrees of hemicephalia presentations of the face are by no means infrequent². It is usually the broad shoulders that cause the dystocia, and so often make operative interference necessary (Hohl records 24 operations in 40 cases), not so much when they follow the trunk, as when they follow the head, the latter having, owing to its small size, but very imperfectly prepared the passage for them. It is therefore always desirable to turn and extract by the feet, where the head presents and progress is delayed. If this is impracticable, if the shoulders are already firmly fixed, extraction should be effected, by introducing the fingers into an opening of the head which has firm edges, or with the blunt hook. If that proceeding too is not easily managed, the arms should be brought down and the trunk extracted with their help; while as a last resource, the trunk may be drawn out by introducing a blunt hook into one or both axillæ.

§ 630. *Acardiac monsters* (cf. Vol. i., p. 275, note) are divided, according as one or other region of the body is developed, into:

(1) *Amorphi* and *mylacephali*. These are spherical masses, covered with skin and without head or limbs, into which an umbilical cord is inserted. The limbs are sometimes just indicated by small tubercles, and in the interior of the mass are some radi-

¹ Cf. Schönfeld, *Monatsschrift f. Geburtakunde*, xiv., p. 378.

² Ahlfeld, "Ueber Schnauseengeburt beim Menschen," *Archiv f. Gynäkologie*, xii., p. 159.

mentary vertebræ, some muscles, rudiments of the intestine and cystic cavities.

(2) *Acormi*. These merely consist of a misshapen head, with a very rudimentary trunk skeleton. The umbilical cord is inserted into the region of the neck; this trunkless monster is the rarest of all the varieties.

(3) *Accephali* or headless monsters. These are the commonest of these malformations; they attain to a high development and are differently named, according to the presence of limbs or of a rudimentary head.

(Abtfeld¹ makes a fourth group, the *acardiacus anceps*. In this variety the form of the body is fairly well developed. The head, trunk, pelvis, limbs and even heart may be present, although in an atrophied condition.)

The *acardiaci* appear always to be twin fœtuses, and at the time of birth are expelled after the healthy child. An *amorphus* or *acormus* is to be extracted, when necessary, in the same way as is a detached head, that has remained behind in the parturient passages. The *acephalic* monster generally presents with the feet, and its passage may be so greatly obstructed by the not rarely co-existing thickness of the trunk and breadth of the shoulders, that it becomes necessary to lessen the former, and even to extract it with the *cephalothryptor*. If the feet do not present and if delivery is delayed, they should be brought down, or, if this is not possible, the trunk may be extracted with the forceps, hook or *cephalothryptor*.

§ 631. *Curvature of the spinal column, curvature and ankylosis of the limbs, adhesions of the latter with the trunk and adhesions of separate parts of the body with one another now and then occur*², either alone or, as is commoner, in combination. They may have an influence on the progress of labour, and not only impede its course, but even before its commencement cause inexplicable difficulties of diagnosis. Ankylosis of the limbs may also cause great obstacles to version and extraction. No rule can be laid down either for diagnosis or treatment. Each case has its own characters, and treatment must be regulated in accordance with them.

Lastly, firm *adhesion of the fœtus to the uterus* and still oftener to the *placenta* has been observed as a cause of *dystocia* and other troubles; Joulin

¹ *Archiv f. Gynäkologie*, xiv., p. 352.

² Cf. Hohl, *l. c.*, and his *Lehrbuch*, 2nd, ed., 1862, p. 551.

(*l. c.* and *Traité d'Accouchement*, p. 368) and Whittaker ("Morbid Anatomy of the Placenta," *American Journal of Obst.*, iii., p. 247) mention a number of such cases. Here also treatment must be based upon general principles, and modified according to the requirements of each particular case.

b. Abnormal Presentations, Trunk or Transverse Presentations.

§ 682. If the longitudinal axis of the cavity of the uterus does not correspond with that of the foetal cylinder, if neither of the two terminal poles of the latter presents within the os and at the pelvic brim, the presentation of the foetus is abnormal. As I have already mentioned, the two axes rarely intersect at an approximately right angle, almost always at a more or less acute one.

We thus get an *oblique presentation*, or, since some part or other of the trunk (varying according as the cephalic or the pelvic extremity of the foetus lies lowest) is situated over the internal os, a *trunk presentation*. A *true transverse presentation*, in the strict sense of the word, is extremely rare, partly because it requires a very short foetal cylinder and a very extensible and non-irritable uterine wall, partly because the commencing contractions flex the foetus at its most yielding portion, *sc.* the cervical region, so that the shoulder is forced furthest down. This condition is spoken of as a *shoulder presentation*, and is the commonest at the time of labour for the reason just given, being however not a transverse, but an oblique, presentation. The body of the foetus may be looked upon as a lever, divided at the neck into two unequal arms, and lying with the shorter arm, *i.e.* the cephalic extremity, on one side, and with the longer arm, that of the trunk, on the other; the latter arm of the lever will of course reach far further up towards the fundus, and is much more vigorously pushed towards the middle line of the uterus, than is the former (fig. 106). But although it would be more logical to speak of these abnormal presentations as oblique or trunk presentations, I nevertheless retain the name "*transverse presentation*", owing to its being in general use.

§ 683. The *attitude* of the foetus may be normal (fig. 106). Generally speaking however it is altered, either before the rupture of the membranes or (and this happens almost invariably) after such rupture; the arm of the presenting side falls down, and side by side with it the umbilical cord frequently does so

also. These however are unimportant complications, for they scarcely aggravate the prognosis, nor do they render operative interference more difficult.

The commonest *position* (cf. also § 162) is that in which the head lies in the left side of the uterus, the breech in the right, this corresponding with what we know occurs in head presentations. When the head is on the left, we have the *first*, when on

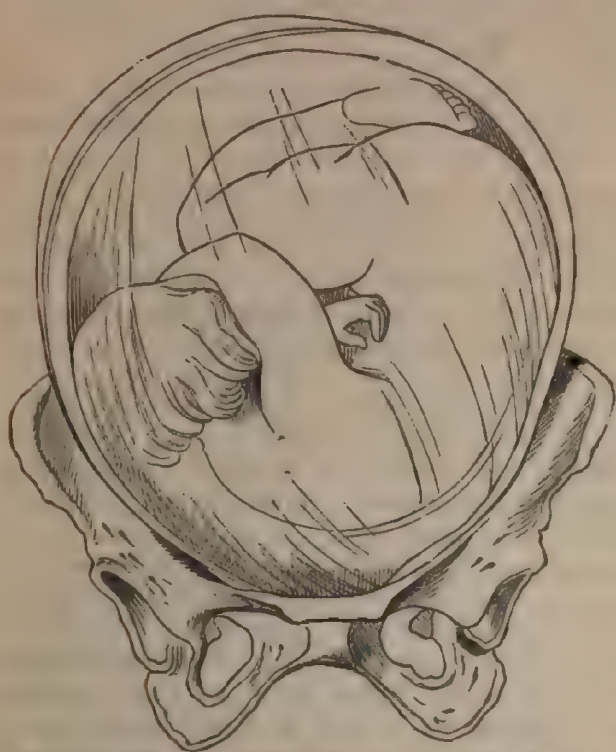


Fig. 106.—Transverse presentation before dilatation of the os.

the right, the *second transverse position*. In both these cases the back is much more frequently directed forwards than backwards, the reason being that transverse presentations are derived from longitudinal presentations, in which the back is of course also generally directed forwards, or else become transformed into them; moreover the concavity of the fetal bow lies most conveniently and comfortably when it is directed backwards

towards the lumbar lordosis. Thus dorsum to the front in both positions forms the *first subdivision*; dorsum to the rear the *second*.

Frequency and Causes.

§ 634. A transverse lie¹, although so common during pregnancy, is very rare at the time of labour, especially in labours at the full term. In § 162 its *frequency* was stated as 1 : 180—a little above '5 p. c., indeed Churchill basing his estimate on a large number of cases puts the average as low as 1 : 252=.40 p. c.; in the Upper Rhine Division (*Oberrhein-kreis*) of Baden it was 1 : 128=.78 p. c. This small proportion will be intelligible, if it is borne in mind that, while the conditions which lead to presentation of the head and to its persistency at the end of pregnancy and at the beginning of labour are rarely absent, it is much rarer still for the relations to be such, as will fail in producing, and maintaining, some form of longitudinal lie. Speaking generally therefore, the *causes* of transverse presentations must be looked for in a want of adaptation between the uterine cavity and the body of the fœtus, in a very flaccid and non-irritable condition of the wall of the former, and in the absence of reflex movements of the latter, in the fact that the cephalic end does not become fixed in the brim of the pelvis. In particular cases we may mention distention of the uterine cavity by a very large quantity of liquor amnii, twin pregnancy, placenta prævia, congenital malformation of the uterus, premature labour, death of the fœtus, great uterine mobility and contraction of the pelvis.

If the *liquor amnii* is *very copious*, the force of gravity alone determines the lie of the fœtus; the wall of the uterus has no share in the matter. When the liquor amnii is discharged slowly, the uterus will resume its normal shape, remedy any existing obliquity in the lie, and convert it into a longitudinal one. If on the other hand the discharge takes place all at once, with a sudden gush, the uterus also diminishes with an equal rapidity, and the fœtus will be fixed in the lie which it happened to occupy; indeed the lower end of the fœtal cylinder, if still unfixed, may be pushed to one side, as a result of the pressure which is suddenly exerted on it by the uterus, and thus a secondary transverse presentation may be produced at the last

¹ This term has been defined in Vol. i., pp. 127, 128 (Tr.).

moment. The same may happen, where there are twins in the uterus; not only may one fœtus prevent the other from presenting longitudinally, but the second twin too, which was originally placed longitudinally, may, after the birth of the first, relinquish its correspondence with the uterine axis, as a result of the sudden alteration in the form of the uterine cavity.

In rare cases *placenta prævia* may cause the presentation to be transverse, by preventing the lower end of the fœtus from engaging in the brim, and by altering the shape of the uterine cavity. But the abnormal presentation (as already pointed out in § 435) is probably more often associated with the fact that labour is generally premature in these cases, and with the abnormality of the uterine wall, which in its turn led to an abnormal placental insertion.

Ever since the time of Wigand and Danyau, an *irregular conformation of the uterus*, especially an excessive width, has been supposed to play an important part in the ætiology of transverse presentations. This abnormal width however is simply the result of an either distinct or merely indicated double formation of the body of the uterus, i.e. is due to the condition which is known as *uterus bicornis infra simplex*, and *uterus arcuatus*. And it is obvious, indeed it has been clearly proved¹, that a slight tendency to the two-horned condition, where the horns unite as high up as the body, and where there is no, or only quite a short, septum, and where perhaps the longitudinal axis is also shortened, must greatly favour the occurrence of transverse presentations.

We have pointed out in §§ 108—109 why *premature labour* and a *dead fœtus* are apt to cause the lie to be abnormal. The alteration in the position of the centre of gravity in the case of a dead fœtus, as well as the greater flexibility of its body, after discharge of the liquor amnii, may also have an influence.

§ 635. Two conditions however appear to be especially important from an ætiological point of view, viz. *multiparity* and *pelvic contraction*.

The great preponderance with which transverse presentations occur in *multiparæ*, is very striking. Thus Chiari² *inter alia* estimates the percentage of *primiparæ* at 20, Späth³ at 22,

Becker, "Die Bicornität des Uterus als Ursache der Querlagen." *Dissertation*. Marburg, 1875.

² *Klinik der Geburtshunde*.

³ *Wiener Medic. Wochenschrift*, vol. vii

Seanzoni at 27. I believe that even these figures are too high; in the Maternity at Berlin the proportion was only about 12 p. c. (25 : 201), as is shown in Schöller's *Dissertation*¹; in my own midwifery practice it is slightly under 6 p. c. (11 : 189). The greater liability of multipare is generally attributed to relaxation of the uterine wall, but this is a very vague statement, and one which is difficult to justify anatomically. To me it seems (apart from the great instability of the lie of the fœtus, which is continued during the last weeks of pregnancy, cf. § 109) rather to depend on the fact that in multipare the uterus is much more mobile, is much less fixed by the abdominal walls and by its pelvic attachments, and that the abdomen is more commonly pendulous.

Again, the circumstance that the head frequently does not become properly fixed in a brim that is narrowed, has undoubtedly a share in the ætiology; still I believe that here also the above-mentioned conditions are the main factors in the frequent association of transverse presentations with pelvic contraction. In the 189 transverse presentations of which I have notes, I find that pelvic contraction is mentioned 46 times, *i.e.* in about 24 p. c. This is precisely the condition in which the attachments of the uterus, especially after successive labours, are most likely to become slackened, and those 46 women were almost all multipare. With a uterus which overhangs in this way, the fœtus lies with its dorsal aspect at the deepest part; the lower end of the fœtus does not lie over the os, but moves up and away from it; and since the uterus is usually at the same time inclined considerably to one side, *sc.* to the right, the lower end of the fœtus lies as a rule on one side of the pelvic brim. This displacement is increased by the circumstance that the women generally lie on their right side, which causes the breech of the fœtus to incline strongly to the right, and the head to be displaced well to the left. Nor is this condition always rectified, even when pains set in, since they do not act in a parallel direction with the parturient axis, *i.e.* not at right angles to the pelvic inlet; the consequence is that a uterus which is bulged forwards and pendulous, does not entirely regain its normal shape.

¹ "Die Aetiologie der fehlerhaften Kindeslagen." *Dissertation*, Berlin. 1898.

Diagnosis.

§ 636. A transverse presentation may be diagnosed in the way described in § 163, and its existence will as a rule be discovered without difficulty. Indeed in most cases external palpation alone suffices to decide the matter; but the position in which the cardiac sounds can be most distinctly heard, is not of diagnostic value.

The vaginal examination reveals either an empty, or a high or a flat, vaginal fundus, which is not forced downwards by any bulky segment of the fœtus; in rare cases small parts, that rapidly escape from the finger, can be felt. As the os uteri opens, the bag of membranes frequently protrudes in a sausage-shaped pouch, and an arm, or at any rate a hand, is often found in it. The external and internal examinations however do not always yield such precise information. The former is often rendered useless by the tense condition of the abdominal and uterine walls, and by the abundance of amniotic fluid; the latter by the high position of the fœtus above the pelvis. Moreover under such circumstances, the diagnosis is rendered all the more difficult by the fact that, if an unnatural presentation is suspected, the examination must be made with the greatest caution, in view of the great desirability of preserving the membranes entire. Where therefore it is absolutely necessary to arrive at a conclusion, the practitioner should, during the interval between two pains, introduce his whole hand, and thoroughly explore the lower segment of the uterus and its contents, and at the same time hold himself in readiness to rectify the presentation, should such a step appear called for. After the discharge of the liquor amnii, the presenting parts may of course be directly palpated.

The shoulder may be recognised by the clavicle, the spine of the scapula, the axilla, the ribs and the intercostal spaces; it is apt however, where labour has rendered the parts very tumid, to be confused with the breech, and also with the lateral portions of the face. But with such a condition an upper extremity will almost always have prolapsed, or at any rate can be brought down without harm, and this will settle any doubt, since with a shoulder presentation the arm may be followed up to its point of attachment. We have already, when dealing with pelvic

presentations (§ 183), mentioned how the upper limbs and their several segments may be distinguished from the lower.

§ 697. In order to *diagnose the position*, it will be sufficient to determine the situation of the head and the direction of the dorsum. Both of these points may often be made out by the external examination alone. When the internal is employed, they will be decided by the direction of the axilla, when it can be ascertained (since it always opens towards the lower end of the body), and by the relation of the scapula and clavicle to the uterine parietes. When an arm presents, the diagnosis is still easier. If the arm is flexed, the fore-arm will correspond to the abdomen of the fœtus. If it is stretched down, the practitioner can easily determine which arm it is, by taking the hand into his own, or thinking of it in such position. The two hands will always belong to the same side, if the thumbs correspond and are in contact, and *vice versa*. The direction of the axilla at the same time indicates that of the head, so that the position will in this way be determined. On the other hand the diagnosis of the latter, before the presentation is rectified, is only of special importance, when rectification is to be effected by external manipulations. In the case of internal version, although it is desirable to select the hand which corresponds to the feet, yet the disadvantages of a wrong choice are merely of subsidiary importance.

Progress of Events.

§ 698. A transverse lie is, as we know, frequently converted into a longitudinal one during pregnancy: indeed such a change ranks as a normal occurrence (*cf.* §§ 108, 109). A similar conversion may occasionally take place during the period of dilatation, the rectification then being spoken of as *spontaneous version*. The fact that the head almost always lies lower than the breech, explains why a head presentation is the usual consequence of such conversion. But occasionally a breech presentation results, even where the head lay lowest, and this may be more or less promoted by the posture of the parturient woman at the time (*e.g.* when she lies, and the breech of the fœtus is, on her right side). Spontaneous version is most often observed at the beginning of the dilatation stage, where the liquor amnii is still *in utero*, the fœtus being then still completely movable; it

is effected by the action of the form-restitution force of the uterus (*cf.* § 153) during the pains, and is considerably assisted by the fetal movements, a fact which explains why it is rarely observed, where the fœtus is dead. In two of the cases which I have met with, a great quantity of the so-called spurious liquor amnii (*cf.* § 91) was discharged at the commencement of labour, and the alteration in the form of the uterus which was thereby made possible, without the membranes being ruptured, appeared to me to play an important part in bringing about the longitudinal presentation. Nevertheless even after the escape of the liquor amnii, indeed even after an upper limb has prolapsed, spontaneous version may take place; I have seen this twice. In these cases however the membranes had ruptured spontaneously, and the liquor amnii had been very abundant; so that I think the version was probably due to the fact that the uterus had till then been unable to resume its natural shape. At any rate spontaneous version can only take place *after* rupture of the membranes under the following conditions: (*a*) the uterus must contract both very feebly and quite regularly, and retain within it some liquor amnii, which the abdominal pressure does not expel during the pains; (*b*) the presenting shoulder must still be very movable, and therefore as yet not have been driven into the cervix.

§ 639. If the fœtus continues to present transversely, the period of dilatation usually runs an entirely natural course. Nevertheless delay in the canalisation of the os uteri is more often observed under these circumstances, than where the lie is longitudinal, and when the membranes are distensible, they protrude a long way down (sausage-shaped bag of membranes) and also rupture at an early period, all of which events are due to there being no fetal part to shut off the fore-waters (*cf.* § 156). Moreover the premature rupture of the membranes has on an average much worse consequences, than where the presentation is longitudinal, partly because neither end of the fetal cylinder can advance and effect the dilatation of the os, in the place of the bag of membranes, partly because the whole of the liquor amnii is apt to be discharged at once or at short intervals, so that no general, but only an interrupted, intra-uterine pressure can come into action. The result is a rapid development of the condition described above (§ 466), in which the uterine wall is

closely applied to the body of the fœtus, with its various sequelæ. The pains grow more or less ineffectual, and the cervix uteri dilates very slowly or imperfectly; further the condition is aggravated by the fact that delivery, which is so urgently called for, cannot be effected without injury.

If however the cervix has become sufficiently canalised by the time of, or soon after, the rupture of the membranes, then, while the presenting arm is prolapsed, the body of the fœtus (lying within the cervix) is flexed upon itself towards its abdominal surface, and the shoulders are pressed into the brim of the pelvis. The pains grow stronger, the internal os retracts more and more towards the fundus, and a moment arrives at which, the shoulder being forced deeply into the brim, the greatest mass of the fœtus, which is more or less rolled into a ball, and merely surrounded by the highly stretched cervix and the lower segment of the body, is *expelled into these portions of the uterus*. The danger of the lower segment of the uterus rupturing is at this moment exceedingly great. If rupture does not take place, the uterus remains in a condition of extreme tension, or else its parietes become closely adapted to the body of the fœtus, and grow stiff in this position (*tetanus uteri*, cf. §§ 465 and 466). If no assistance is even now forthcoming, the mother's supply of strength will gradually ebb away, and she dies either from sheer exhaustion, or from the results of septicæmia, metritis, and peritonitis. The fœtus almost always perishes early, owing to the severe pressure and to the interference with the placental interchange of gases.

§ 640. In exceptional cases however a fœtus may be born spontaneously, even when the transverse presentation is left to itself, delivery being then effected (a) either by the process of so-called *spontaneous evolution*, or (b) by that known as *expulsion corpore conduplicato*, in which the body of the fœtus is completely doubled up. These are two distinct processes, which were vaguely recognised as early as the time of Denman, but only accurately described by Douglas in 1811. They have however been confused by most obstetricians, and spoken of as the same processes, sometimes under one, sometimes under the other, name.

(a) *In the case of spontaneous evolution, the fœtus revolves within the pelvic outlet, in such a way as to give rise to a breech*

presentation. For this purpose the expulsive forces must be enormously increased. The shoulder is forced deeply into the outlet of the pelvis, while at the same time, under the influence of the strong pains, the fœtus is driven into the pelvis with its body so much flexed upon itself, that the lower half of the trunk glides down along the upper half and passes out, being followed by the hindmost shoulder with its arm, and by the head (figs. 107—110). In other words, the strong pains (even with such the process may take a very long time) force the presenting shoulder further and further down, so that its arm reaches far out of the vulva. While the head is now acutely flexed upon the other shoulder, and rests above the antero-lateral pelvic wall, as much as possible of the trunk is driven into the pelvic cavity. At this point a rotation takes place, by which the axis of the body of the fœtus comes to correspond nearly with the antero-posterior diameter of the pelvis; the shoulder rests beneath the symphysis, the head lies above the latter, the breech is near the ilio-sacral synchondrosis. The shoulder and nape then form a centre, round which the body revolves on its transverse axis, and is delivered. The pelvic extremity, upon which the force of the pains is now concentrated, descends more and more, the side of the thorax appears in the vulva, and the breech glides rapidly over the perinæum; next come the legs, which were extended upwards, and at last, after an interval of varying length, the shoulder that had been detained, with its arm and the head.

It is obvious that such a process can only take place, where there are vigorous pains, where the soft parts are in a favourable and yielding condition, and where the pelvis is on the whole capacious. Pelvic contraction however does not absolutely preclude spontaneous evolution, as is shown by an instance recorded by Greuser¹; but the narrowing must be confined to the conjugate, and the transverse diameters must be wide, and the child not bulky (in the case just mentioned, it was premature and macerated). Smallness of the fœtus is however not an absolute *sine qua non* for spontaneous evolution, as has been so generally supposed; that condition is only necessary for delivery *corpore conduplicato* (cf. *infra*). On the contrary, in cases of spontaneous evolution the children have frequently been observed of very fair size, so much so, that it would almost seem as if that process

¹ *Manuscript f. Geburtshunde*, xxvii., p. 414.

Fig. 107.



Fig. 108.



Fig. 109.



Fig. 110.



Figs. 107—110.—Illustrative of the various stages of spontaneous evolution.

generally occurred where the fœtus was mature and well developed. Nor are such children necessarily still-born; amongst 125 cases collected by Simon¹, 14 were saved². Nevertheless the death of the fœtus, with its effects on the physical condition of the body, and a diminutive size (twin births) are factors which favour spontaneous evolution.

The prognosis for the mother is by no means bad; Simon only speaks of 3 fatal cases amongst his 125.

§ 641. (b) In the case of delivery with the body completely doubled up, "*conduplicato corpore*" according to Roederer, the trunk is flexed to its utmost limits, so that the parts of the body which lie above and below the point of flexion, pass through simultaneously, and the segments of the vertebral column which are bent one upon the other, run almost parallel (fig. 111). The head is pressed well in upon the thorax, while the upper arm rests extended between head and breech. The lower shoulder is delivered first; next comes the head with the upper end of the trunk; last of all the pelvic extremity and the thighs. This mode of delivery is much rarer than spontaneous evolution³, and occurs principally with small

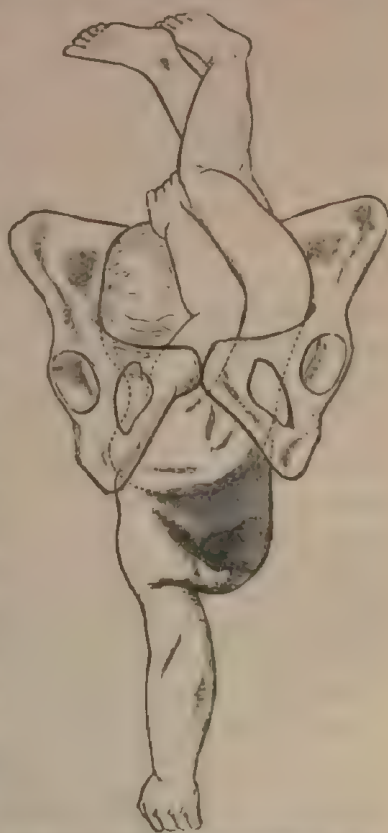


Fig. 111. — Delivery "*corpore conduplicato*".
(According to Kleinwächter.)

¹ "Die Selbstentwicklung." Dissertation, Berlin, 1867.

² Jakesch (Wiener Med. Wochenschrift, No. 13, 1877) and Le Roy (Arch. de Tocolog., April, 1877) also saw living, although premature, children born by means of spontaneous evolution.

³ Kleinwächter, l. c.; Barnes, *Obst. Operations*, 2nd ed., 1871, p. 122; Ford *British Medical Journal*, Jan. 12, 1878.

and flabby fetuses, or with such as, if mature, are macerated. Contraction of the pelvis is even less an obstacle than with spontaneous evolution, so long as it is confined to the conjugate; indeed antero-posterior contraction at the brim may favour the process, by preventing the rotation of the fœtus round its transverse axis, which is necessary for spontaneous evolution. Delivery "*corpore conduplicato*" is moreover considerably promoted, if under favourable conditions traction is made on the prolapsed arm. I need hardly add, after what has been said, that the child will probably always be sacrificed.

Treatment.

§ 642. The rarity with which a transverse presentation is spontaneously rectified during labour, and with which the last-mentioned modes of spontaneous delivery occur, together with the facts stated in § 639 as regards the sequelæ of such an abnormal presentation, when left to itself, would render the prognosis extremely bad both for mother and child, if such presentations were not artificially rectified in the great majority of cases. Indeed in spite of this artificial aid the *prognosis* is much less favourable than it is with a longitudinal presentation, for the reason that operative, and indeed usually intra-uterine, measures are required. The prognosis in any individual case must therefore depend on the way in which, and not least on the time at which, the operation is performed. For a detailed description of "*Version*", I must refer to the chapter devoted to "*Obstetrical Operations*". Here I shall merely give a general outline of the treatment to be adopted.

§ 643. If a transverse lie is discovered in a *pregnant woman*, an attempt should always be made to rectify it by external manipulations, and they will generally be successful. The accoucheur however must not be unduly elated over his apparent success, for on the one hand the abnormal lie is apt immediately to recur, and on the other hand in most of these cases spontaneous rectification takes place before labour, as indeed is proved by the rarity of cross births at the time of the latter. The wisest plan is, bearing in mind the causes of a transverse lie, to apply, and let the woman permanently wear, a suitable abdominal bandage; this will at least keep within bounds the pendulousness and great mobility of the uterus.

§ 644. During the whole of the period of dilatation moreover, provided the membranes are entire, an attempt should be made (and repeated if necessary) to bring about a *longitudinal presentation* by means of *external manipulations* and *appropriate posture*. To begin with, the parturient woman should be directed to lie on the side towards which the head is deflected. This will have the effect of causing the uterus, which has hitherto formed an angle with the couch, to run more or less parallel with it; the trunk of the fœtus will be similarly affected, especially as gravitation acts in the same direction. Consequently the head must move away from its extra-median position down towards the brim of the pelvis, whereupon the lie at once becomes longitudinal. The practitioner moreover may assist the head in engaging in the inlet, if he wedges a firm pillow in between the couch and the portion of the abdominal walls against which the head rests, so as to force it towards the brim; but he must not be over-sanguine of the success of this manœuvre. It is of great importance to recommend the woman to maintain this exact posture during the pains; nor should she immediately and suddenly relinquish it, when they subside.

Rectification by means of external manipulations (a method which is named after its principal advocate Wigand), presupposes an even more intimate acquaintance with the relations of the fœtus to the uterus, than does the postural method of rectification. It consists in pressing the head with one hand towards the pelvic brim during the interval between the pains, while the other forces the lower end of the trunk (sc. the breech) towards the fundus uteri, i.e. in an opposite direction. Occasionally, where the uterine walls are very lax, the head or breech may be grasped with the whole hand, and a longitudinal presentation rapidly brought about by vigorous movements; but much friction and stroking are to be avoided, since they invariably and quickly bring on pains. If the latter set in, the only thing to be done is to watch that the fœtus retains the lie into which it has been brought, and this may be ensured by steady equilateral pressure. These manipulations can be carried out either in the dorsal or in the lateral posture; but I prefer the latter, since it assists them, while moreover the pains are better able to render permanent any good result which has been effected. The bladder of course must

always be emptied, before any manipulations are attempted. Supposing now that a longitudinal presentation has been produced, and that the canalisation of the cervix is sufficiently advanced, the bag of membranes should next be opened, when possible, during a pain; this is done, in order that the terminal point of the fetal cylinder, generally the head, which has been brought into the pelvic brim, may be driven into it, and fixed there. If however the os is insufficiently dilated to allow the membranes to be ruptured, the woman must be placed in the position described above, her uterus and the fœtus being fixed by binder and pillows. These measures should always be tried, when time permits, and where the existing conditions point to the possibility of success; they constitute the mildest method, and if they do fail, *version* (*bimanual* or *internal*) in the strict sense of the word always remains as an alternative. It is with large and living fœtuses that success is most frequent, owing to their greater resistance and stability. Occasionally such success may be obtained, even after the liquor amnii has escaped.

§ 645. In the great majority of cases however, all attempts at rectification by external means must be renounced, when once the membranes have ruptured. Bimanual or combined podalic version (Braxton Hicks' method, *cf.* § 894) must then be resorted to. If this fails, and if the os uteri is still insufficiently patulous, the best plan is to wait; where the os is dilated, *internal podalic version* (§ 898) must at once follow. The former condition of things may be a very serious one, as has been shown in § 639. Every examination, that is not absolutely required, should then be avoided, the woman must be forbidden to stand up, or to make the least bearing down effort; any forcing sensations must be alleviated by large subcutaneous injections of morphia. Moreover it may be useful to exert counter pressure on the lower segment of the uterus, by plugging it with a carefully disinfected india-rubber bag, a proceeding which has the further advantage of preventing any further copious discharge of amniotic fluid.

If the lying-in woman is not seen, until the shoulder is firmly impacted in the pelvis, and the uterus has become closely applied to the fœtus, version should not be attempted, until all the parts have been rendered as flaccid as possible by means of chloroform anaesthesia. During the latter a skilful hand will generally

succeed in turning, even in the most difficult, apparently hopeless, cases, especially if the accoucheur is not alarmed by the word "tetanus uteri". Indeed, as is explained in § 466, it is just under these circumstances that the operating hand so often assists the efforts of the uterus in resuming its normal shape.

§ 646. When the uterus (sc. feet) is really inaccessible to the hand, when the trunk of the fœtus is forced far down and is immovable in the pelvis, *embryotomy* is as a rule the only resource left: either decapitation, or division of the vertebral column with, or without, evisceration (spondylotomy of Simpson), followed by extraction either *corpore conduplicato* or with the lower end of the trunk first, as happens in the process of spontaneous evolution (*cf. supra*). Occasionally one of these processes may be imitated and furthered *without injury to the child*. Thus it may be possible to effect spontaneous evolution, by passing a blunt hook into the groin, and with its help performing intra-pelvic version; indeed the child may be saved by this means¹. Or else extraction *corpore conduplicato* may be brought about by pulling at the arm, where the fœtus is small and yielding. If the accoucheur happens to find one of these processes in progress, it will rarely be wise for him to remain an idle spectator and to allow matters to pass off spontaneously; the welfare of the parturient woman demands that delivery be accelerated.

c. Abnormal Position and Attitude.

§ 647. The *abnormal way in which the fœtus* sometimes *arranges*, together with *abnormal fetal rotations* have been described in the part of this Text Book, that is devoted to the mechanism of normal labour and of labour associated with pelvic contraction or the presence of twins. I need not therefore go into further detail. But I should like once again to call attention to the fact that these abnormalities ought, at any rate in the first instance, to be looked upon as results of some other abnormal condition, either simply connected with the parturient canal or with the relation of the uterus or fœtus to it; and that therefore the most accurate investigation of all the circumstances is necessary, before a correct opinion can be formed as regards either prognosis or treatment. If this plan is followed, the great majority of the

¹ *Cf. Maximal Schmidt's Jahrbuch*, vol. 168, p. 157.

so-called "abnormal" positions will be found to be the best that could possibly exist under the circumstances, and the practitioner will but rarely feel himself called upon to "improve" upon them; he will interfere less and less, but what he does will be more judicious. Where however the position clearly appears to be an abnormality in itself, more good will be effected by directing the woman as to what is the most appropriate posture for her, and this the experienced accoucheur will in any particular instance readily fix upon, than by forcibly altering the position with hand or forceps. Under such circumstances however a complete conversion of the fetal presentation, i.e. version, might, if practicable, prove the best means of rectification.

The principal abnormalities in the attitude of the *fœtus* have also been dealt with; those of the head under face, brow and nural presentations; prolapse of the limbs under pelvic and transverse presentations in the appropriate sections. I have therefore here merely to deal with

Prolapse of the Extremities by the Side of the Head.

§ 648. Prolapse of the arm in a transverse or in a pelvic presentation, or the descent of the thighs before the breech is a frequent and for the most part an unimportant event.

The same remark however hardly applies where the limbs prolapse by the side of the head. Sometimes small parts are felt by the side of the latter even during *pregnancy*. Such a condition seems to indicate that an alteration in the lie and position has just occurred, for as a rule the limbs can no longer be felt, if another examination is made soon afterwards. As the head becomes fixed in the lower segment of the uterus and in the brim of the pelvis, they disappear. If a part of a limb is felt by the side of the head, after the dilatation of the os has begun, that segment will usually be the hand; and in that case too it is almost always withdrawn, when the head becomes more fixed, or else it is pushed aside by the latter.

When however the whole arm, or the greater part of it, or the thigh *presents*, before the rupture of the membranes, events take a different course; for then when the bag of membranes bursts, the limb descends in front of the head, i.e. *prolapses*.

(1) *Prolapse of the Arm.*

§ 649. Prolapse of an arm is mainly due to a defective adaptation of the head to the lower segment of the uterus, and to the former engaging in one side of the pelvis. Thus in special cases abundance of liquor amnii, a marked lateral deflection of the uterus, a small head and pelvic contraction may be causes; further, premature labour and especially the death of the fœtus greatly favour prolapse, since the latter can no longer retain its normal attitude, and its limbs hang down in a flaccid manner. It is not uncommon, when under the supposed conditions the liquor amnii is discharged during a pain, and the abdominal pressure at the same time acts vigorously, for the arm only then to be washed down.

The result of the complication depends on the position in which, and on the distance to which, the arm has prolapsed, on its relation to the head, and on the width of the pelvis. Difficulties are most likely to occur, if the prolapse has taken place at the anterior pelvic wall; for the arm will then encroach to a much greater extent on the available space, than when it lies at a corner of the posterior wall, *i.e.* in front of one of the ilio-sacral articulations; delayed progress, irregular rotation of the head, and bruising or even fracture of the arm may follow. Such results however need not necessarily happen; the head and arm may be born at the same time without any injury, or the head may descend past the arm. The prolapse is most unfavourable in cases of pelvic contraction, since it then prevents the head from becoming fixed and moulded to the brim. There is moreover always a gap (although sometimes only a small one) left at the side of the arm, through which the cord might also descend.

It is never difficult to *diagnose* the prolapse, although it might be less easy to decide to which side the prolapsed limb belonged. The best way of determining the point is to examine the relations of the arm to the head, while on the other hand the position of the head can also be inferred from the nature and relations of the extremity, if the head is still so high that its characteristics cannot be distinctly made out.

§ 650. *Treatment.* If the liquor amnii has not yet escaped, the parturient woman should lie on the side opposed to that of the prolapse, while by means of external pressure the accoucheur

encourages the head to engage fully, and to become fixed in the brim; he may still further promote this object, by carefully pushing back the arm during the intervals between the pains, *i.e.* of course through the membranes. Should this manœuvre however not prove successful, he should *replace* the arm, as soon as the os is so far dilated that rupture of the membranes need no longer be feared, for that event is almost certain to take place. Again, reposition should be effected, if the case is not seen until after the discharge of the liquor amnii, and the head is still high and movable. For this purpose the woman must be so placed as to permit of free manipulations; which hand is chosen for the operation depends upon the position of the prolapsed arm. The accoucheur having introduced his whole hand, should pass it over the head as far as the chest of the child, at the same time holding it in such a way that, when the prolapse has taken place in the front part of the pelvis, the back of the operating hand may look forwards, but towards the thoracic synchondrosis, when the limb lies posteriorly. After the reposition, an attempt should be made, during the withdrawal of the hand, to cause the head to engage fully. External manipulations and expression will increase and ensure the success of these various manœuvres. If however reposition is found impracticable, if the head cannot be brought firmly into the brim, if it again and again glides to one side, and if the arm again descends, *podalic version* will have to be performed. Especially is this operation called for with a flat pelvis, in order to avoid the excessive delay which will inevitably be required for the adaptation of the head, if indeed such adaptation takes place after all.

If, when the woman is first seen, the head is already found to be lying in the pelvis together with an arm, the labour may be left to itself, and as a rule it will terminate spontaneously. Sometimes however this result may be promoted by appropriate posture, by pushing the limb to one side towards the forehead, *i.e.* towards the sacral excavation. Occasionally, even when the arm and head are both at the outlet (this is a very common seat of difficulty), the accoucheur may still be able to push the arm up a little, or to displace it sufficiently to liberate the head. When the delay makes it necessary to put on the *forceps*, the blades should be pushed in cautiously between hand and arm.

Care must be taken not to seize the latter, or even to pull upon it and the forceps at the same time; otherwise a bad fracture might easily result.

§ 651. Under the term "*dorsal displacement*", Sir J. Simpson¹ and (since his time) others² have described a condition in which the arm lies transversely across the back of the neck, giving rise to a projection or ridge which hitches above the anterior pelvic wall, and prevents the head from engaging and descending. This kind of obstruction may lead to considerable difficulty, and can only be detected by making an examination with the whole hand, as is best done under chloroform. Simpson advised that the arm be brought down, so as to form a prolapse. But considering how difficult it is to carry out this manœuvre, where the head is above the brim, and the possibly injurious sequelæ of such prolapse, it is certainly better to perform podalic version.

(2) *Prolapse of the Foot.*

§ 652. The prolapse of one or both feet may be artificial, *i.e.* the extremity may have been brought down with a view of turning (the complete operation having failed); or it may be spontaneous. Spontaneous prolapse is very rarely seen, where the fœtus is mature and living³; generally speaking in such cases the fœtus is immature and dead, as a result of which its body is flaccid and non-resisting. Under the latter circumstances moreover several extremities, indeed all four, are sometimes found presenting, and are usually accompanied by the umbilical cord. The causes are the same as those mentioned above (§ 649); prolapse with a living and mature child is probably mainly connected with an incomplete change of lie from, or into, the cephalic.

The complication is rarely a serious matter, for the reason that it generally occurs where the fœtus is premature and dead, and in multiparæ. Only when the child is at the full term, and the pelvis contracted, and when it is impossible to place the fœtus longitudinally in consequence of the uterus being much contracted and the internal os retracted (especially after unsuccessful attempts at version), may the condition become very awkward,

¹ Cf. Simpson's *Selected Obstetrical Works*, 1871, i., p. 381.

² Cf. Murray, *Medical Times*, 1861; Lambert, *Edinburgh Obst. Transactions*, 1872; A. Simpson, *Obstet. Journal Great Britain*, Nov., 1879, p. 520.

³ A number of instances are given in Nägele-Greaser's *Lehrbuch*, 8th ed., p. 621.

more particularly in the latter case, when the upper limbs prolapse at the same time.

Treatment must depend on the peculiar features of each case. If the os is not yet fully dilated, and if the membranes are still entire, an attempt may be made by appropriate posture &c. to cause the head to engage fully, and to induce withdrawal of the limb. After the discharge of the liquor amnii, if there is no hurry, and if there seems a possibility of success, it may be well again to tempt the head to engage by pushing back the foot: the latter must only be pulled at, if it is definitely desired to produce a footling presentation. On the other hand the practitioner must not spend too much time in trying to replace the foot. Version should before long be substituted, the head being pushed back, and the breech at the same time pulled into the pelvis by means of the foot. Indeed in cases where several limbs prolapse and the pelvis is contracted, this course should be adopted forthwith.

It is sometimes extremely difficult to bring about a pelvic presentation (*cf. sub* Version). Moreover where several limbs are prolapsed, care should be taken not to confuse this condition with twin fœtuses, since if twins were present, it would generally be a very serious error to bring down the feet instead of the presenting head. If the head is low and fixed in the pelvis, the forceps may be used. Perforation will probably never be required in ordinary cases of prolapse, but it might be necessary where the fœtus is dead, or the pelvis simultaneously contracted.

d. Anomalies of the Fœtal Appendages.

(1) Anomalies of the Fœtal Membranes.

§ 653. The membranes may be *abnormally fragile*, or *abnormally tough and extensible*, and, when in such a condition, are apt to rupture in one of the unusual ways mentioned in § 147. Neither premature nor delayed rupture however depend simply on the degree of the resistance of the membranes. Delay in the time of rupture is perhaps the commonest abnormality, and is generally due to great extensibility, owing to which the bag of membranes may be driven down to, or beyond, the vulva. The same condition may be due (amongst other causes) to the chorion

being unusually displaceable upon the decidua, or to a tear having involved the chorion, while leaving the amnion intact.

Delay in the discharge of the liquor amnii is not followed by any special disadvantage, nor indeed is the so-called *prolapse of the bag of membranes*, i.e. the condition in which this bag (consisting either of both membranes or only of the amnion) forms a relaxed or tense pouch outside the vulva, and in which the membranes are twisted in a more or less cordlike manner within the vagina. I have more than once met with this anomaly, although always with small (especially dead) fetuses, and then too when the cervix was not yet quite dilated. Delay in the rupture of the membranes can only have a retarding action on the progress of labour, when the further expression of the ovum is resisted by their firm attachment to the placenta or uterine wall. Artificial perforation of the membranes will soon set matters right (c/. § 456).

§ 654. In order to "*rupture the membranes*", the index finger should be bored into the bag of membranes (generally near the end of a pain, while the bag is still tense, rarely at the acme), and the tear at the same time somewhat increased with the finger. If this plan does not succeed, either because rupture has to be done during an intermission, or because the bag of membranes is too flaccid, or the membranes too little resisting, a fold may be seized between the index and middle finger, or between the former and the thumb, and the tissue pinched or scratched through. If this also fails, a fold may be seized with a pair of long dressing forceps, and twisted until it tears through. Or else a blunt-pointed instrument (e.g. a long needle or sound) may be substituted, and bored into the amniotic cavity under the guidance of the fingers. The last method however should only be selected as a *dernier ressort*, since the punctured aperture is apt to remain of its original small size, and the membranes are not then drawn to the sides; moreover there is more risk of the presenting part of the child and of the parturient tract being injured. For the same reason I cannot recommend that the puncture be made with the trocar; nor will that instrument often be at hand in ordinary practice. The various "*membrane perforators*" are obsolete.

§ 655. The *premature discharge of liquor amnii* may be favoured by tenuity and fragility of the membranes. But it

mainly (*cf.* § 156) depends (*a*) on the pressure to which the fore-waters are exposed, and on the relation of that pressure to the general intra-uterine pressure, in other words on the relation of the presenting part of the fœtus to the lower segment of the uterus; and (*b*) on the extensibility of the membranes and their displaceability upon the uterine wall. Nor must it be forgotten that when membranes attached to the placenta are found to be very lacerable, they may often only have become so during labour as a result of infiltration.

We have so frequently spoken of the causes and sequelæ of premature rupture of the membranes, when dealing with the various abnormalities described above, that I may content myself here with summing them up:

Premature rupture of the membranes may precede the onset of the parturient activity¹, but more often accompanies it, and occurs most frequently of all, when the os is only slightly dilated. On an average it happens earlier in primi- than in multipare, indeed generally speaking the former are affected as often again as the latter, while women in whom the lower segment of the uterus is but little prepared and softened are especially liable. Abundance of liquor amnii, plural pregnancy, pelvic contraction, unusual size of the fœtus (especially boys), and abnormal fetal presentations are predisposing elements.

The duration of labour is as a rule materially increased, the more so, the earlier the rupture occurred, and the less of liquor amnii remained *in utero*. Anomalous pains are therefore not infrequently associated with such premature rupture, prolapse of the limbs and cord, as well as hæmorrhage during the stage of the after-birth, also being occasional consequences. Mechanical interference is more often called for than when rupture happens at the proper time, these undesirable results being particularly common and well marked in primipare. Further, on such results depends the influence of premature discharge of the liquor amnii on the post-partum period, and on the fate of the child during delivery; but in no case is it as great as many practitioners still suppose.

The conduct of the accoucheur must be regulated according to

¹ Hennig (*Archiv f. Gynækologie*, xiii, p. 290) has seen it occur 6 weeks before the expulsion of the fœtus; Conrad (*Schweizer Correspondenz-Blatt*, No. 20, 1877) and (Poulet, *Annal. Gynec.*, xii, p. 243) have each recorded an interval of 2 months.

the symptoms. As a general rule however, all he has to do is to avoid making any unnecessary examination (so as to avoid introducing air into the uterine cavity), and to forbid the woman to assume the erect posture, or of course to walk about, this being done so that as much liquor amnii as possible may be retained in the uterus.

(2) *Anomalies of the Liquor Amnii.*

§ 656. The anomalies of the liquor amnii will be found described in the chapter on "Diseases of the Ovum", § 354 *et seq.* *Excess in quantity* (hydramnios) is the only condition which leads to difficulty during labour, and it has been discussed in the paragraphs referred to. No evil result has been attributed to a *deficiency in the quantity*, nor have I ever seen any. At most might the rupture of the membranes be retarded by the absence of any fore-waters (*cf.* § 156), and the progress of the head be thus interfered with. Such difficulty, if met with, may at once be overcome, by rupturing the membranes as soon as the os is fully dilated, or nearly so.

(3) *Anomalies of the Umbilical Cord.*

§ 657. The umbilical cord is only a cause of difficult delivery, when *unduly short*. This shortness (*cf.* § 99) may either be *absolute*, or it may be *relative*, *i.e.* be due to the cord (which is either of normal, or slightly less than normal, length, or possibly much longer than normal) being wound round the fetus, so that the free portion is alone available. We have already discussed (§ 375) the direct effects of such *coiling*.

Undue shortness can only delay the progress of the child through the lowest part of the parturient canal. Progress within the pelvic cavity is so gradual, that the uterus retracts at the same rate that the child advances, with the result that the distance between the ends of the cord, or at any rate that between the ends of its free portion, remains approximately the same. The condition however is different, when the child is passing out, for then the placental end of the cord does not descend to the same extent as the fetal; cases of breech presentation, in which a short cord passes between the thighs of the child, afford the best illustration of this. On the whole however great tension and consequent difficulty in delivery as well as premature detachment

of the placenta and hæmorrhage, are very rare results. It is much commoner for relative shortness to affect the way in which the head and shoulders pass out, by giving rise to abnormal positions and rotations.

The signs, which are supposed to indicate shortness of the cord (viz. progress of the child during the pain and recession during the interval, without an extensive and rigid pelvic floor having anything to do with such recession; fixed dragging pain in the uterus, at the part where the placenta is supposed to be inserted; the discharge of some blood after every pain; a high position of the fundus uteri; persistent tension of the walls; arrest of the pains), are one and all quite unreliable, and are capable of a variety of other and more plausible explanations. The only way to be certain is to feel the cord, and actually to make out that it is abnormally tight and stretched. This condition for instance may be observed, if after delivery of the head the cord is coiled round the neck; or early in breech presentations, when the child rides on its cord, or lastly when the child has emerged as far as the navel. Sometimes moreover before the exit of the head, the cord can be felt *per rectum* to be coiled round the neck.

The treatment has been given above (*cf.* § 375). If the cord is found to be very tense and stretched, it should be cut through, and the child of course immediately extracted. It is only with a breech presentation that it is necessary first of all to tie the foetal end or still better both ends, since some time of course is always required in such cases for extracting the child. Where the head presents, it will be sufficient to compress the foetal end with the fingers, during the short interval that elapses before the trunk makes its exit. My experience however makes me think that only in exceptional cases need the cord be cut. I have always avoided such a step, by following the directions laid down for the management of labour with a pelvic presentation (*cf.* § 188). If the exit of the head is found on examination *per rectum* to be hindered by a tight coil passing round the neck, extraction with the forceps will be called for.

We shall deal with cases in which complete delivery is delayed, owing to difficulty in the removal of the placenta, when describing post-partum hæmorrhage (§ 499).

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B. Labour Associated with Dangerous Complications.

There are a great number of diseases which influence the progress of labour, and which through it are apt to assume a dangerous degree of severity. We have already spoken of most of them, in the first chapters of the Pathology of Pregnancy (*cf.* Vol. i. p. 336), especially of the cases in which otherwise physiological phenomena of the puerperal state become morbid through their intensity, and of complications due to intercurrent diseases. Here we shall merely deal with the principal complications which are directly connected with labour, and which are extremely perilous to the life of the woman (*cf.* § 445), although they do not directly interfere with, or at any rate prevent, the spontaneous termination of parturition.

1. Puerperal Eclampsia.

§ 658. This name is applied to the epileptiform (*i.e.* tonic and especially clonic) general convulsions, associated with loss of consciousness during the attacks and with coma after them, which appear during, and are due to, the puerperal processes. On the other hand convulsions caused by severe hysteria, those due to incidental lesions and diseases (apoplexy, poisoning), as well as those which are clearly epileptic, are to be kept distinct, and should rather be looked upon as accidental complications.

Amongst the morbid conditions which stand in causal relation with the puerperal processes in the sense referred to above, we at the present time only know definitely of one, which has the power of provoking eclamptic convulsions, namely the renal affection which is either caused, or at any rate aggravated, by the puerperium, and which has given rise to uræmia. Of course in speaking of *eclampsia as only puerperal*, where such renal disease is present, I do not mean to assert that that is the only possible origin of the aggregate of symptoms met with in these cases, that those symptoms therefore are always due to this single cause. There are a number of instances on record in which no renal disease

whatever was detectable; and for these also (excluding of course accidental complications) it is sometimes possible to demonstrate an ætiological connection with the puerperal condition. Nevertheless the renal disorder is by far the commonest cause, it includes all the worst outbreaks of the disease, cases belonging to the last-mentioned category invariably being less severe. I think therefore that I shall not go wrong, if (keeping in mind the above reservation) I, broadly speaking, only regard that eclampsia as puerperal, which is due to intoxication by the constituents of the urine. But before going more into detail as regards the pathogenesis, I will describe the disease from its clinical aspect.

§ 659. Eclampsia is comparatively rare. Its frequency is estimated at about 1 : 500, although even this proportion is probably too high. The busy accoucheur frequently does not see a single case during a long period, and then several cases come in rapid succession, without any apparent explanation of this occasional frequency. If it is not accidental (and the same kind of thing happens with other rare events), the reason must be sought for in atmospheric conditions.

The disease may break out at any phase of the puerperium, but in the great majority of cases only does so *during labour*, especially during its first half. In *pregnancy* it is rarely seen before the end of the 6th month. Nevertheless I (*Monatsschrift f. Geburtskunde*, xxxii., p. 385) and Paetsch (*Verhandlungen d. Gesellschaft f. Geburtshilfe*, Berlin, iv., 1851, p. 26) have each seen a fatal case in the 5th month; Willis (Velpéau, *Die Convulsionen &c.*, translated by Bluff 1835) one as early as the 4th month; Hoeker (*Beobachtungen und Untersuchungen*) one at the beginning of the 4th month; and Danyau one in the 6th week, which ended successfully with the extraction of the ovum. The outbreak of the disease is generally followed by labour, although it need not necessarily be so immediately; sometimes an interval of several days intervenes; occasionally too, as I myself have witnessed, the convulsions subside, without interrupting pregnancy. When the invasion follows on the completion of labour, it generally does so very speedily; only in quite exceptional instances has delay been observed (Legroux saw it on the 14th, Lumpe on the 24th day, Simpson as late as 8 weeks). These cases of post-partum eclampsia are, generally speaking, much less severe than those of pregnancy; in some severe and

indeed fatal instances, there were probably other factors at work.

Progress.

§ 660. In the majority of cases the convulsions are preceded by *premonitory symptoms*, which may be quite obscure and are therefore often unnoticed, while at other times they are very obvious. They consist mainly in sensory and gastric disorders, and edema of the limbs and face: head-ache (frequently unilateral), vertigo, depression, ill humour; amblyopia or true amaurosis, and even attacks of intermittent fever: dyspepsia, nausea and vomiting. Edema is an especially suspicious symptom, when it affects the hands and face. Frequently it is only transitory, appearing in the morning, after the woman has been lying, and disappearing in the course of the day; the cause lies in an alteration of the pressure relations by posture.

The actual invasion of the disease is marked by the first *attack*. This resembles an epileptic fit, but is generally much severer. Moreover the introductory cry is absent; tonic and clonic spasms of the most varied description alternate with each other, but it is not possible to distinguish first a tonic and then a clonic stage. There is a complete loss of consciousness.

At the moment of the attack the previous restlessness increases, and the features alter; the eyelids are rapidly and successively closed and opened, the eyeball is rolled to and fro, or else is directed fixedly upwards, or there may be an external squint; the pupil is wide and sluggish. The mouth is drawn to one side, the teeth grind, the tongue is thrown in every direction and bitten, so that it bleeds; the head is drawn to one side as in tetanus, or else thrown backwards. The fists are clenched, the arms and legs too (although less) are jerked in this and that direction, or else extended in tonic spasm; the whole trunk is rolled to one side, curved or extended in rigid opisthotonus. Severe shocks fly through the whole frame, and threaten to throw the patient from the couch. At the height of the seizure the respiratory muscles share in the spasms, and respiration is momentarily arrested. The face is at first pale, but soon grows livid and cyanosed, the conjunctiva is injected, the carotids beat violently. During the attack the pulse is small, soft, generally frequent, often intermitting, and the temperature is raised. A

clammy perspiration soon breaks out over the whole body; the bowels and bladder frequently act involuntarily.

After a short time the violence of the attack subsides; the convulsions either cease all at once, or gradually subside, after the interval has been broken by some short shocks; the eyelids close, blood-stained froth escapes from the mouth, and the lips as well as the tongue are bitten and swelled. Respiration grows quieter, and occasionally is of a deep sighing character; the separate inspiratory acts are sometimes separated from each other by long pauses, as in the so-called Stokes' breathing. The pulse grows fuller and slower, the temperature rises still higher, the face is cyanosed and injected, and has a vacant expression; the patient lies asleep, but is every now and then partially roused and disturbed by uterine contractions. At first the sleep is still light; and if the pause is prolonged, full consciousness may again return. But it is all the less likely to do so, the severer the attack. If there have been repeated attacks, consciousness may not return at all.

The *paroxysm* rarely lasts more than a minute; in the majority of cases only 10—30 seconds. Statements as regards a longer duration must be based upon error, as far as my observations have gone; the mistake possibly arises from two rapidly successive attacks having been considered as a single one. A long duration is moreover incompatible with continued life, since the respiratory muscles are involved.

The attacks recur after intervals of variable duration; a single or even a very small number of paroxysms is rarely observed. The severer the first attack, the more rapidly does a fresh one generally follow, and the number may be extraordinarily large; in 135 cases collected by Brummerstädt (*Bericht aus der Central-Hebammenanstalt zu Rostock*, 1866) the number varied from 1—81; Depaul speaks of having seen 160 (*Leçons de Clin. Obst.*, 1872, p. 288).

Unusual phenomena in the course of the disease are: a condition of excitement during the interval between the attacks, combined with complete unconsciousness; unilateral paralysis and local twitchings; an incomplete awakening of the patient from the coma after a series of attacks, followed by a still deeper coma in the next—conditions which I have seen more than once.

§ 661. The view that the *pains* bear a causal relation to the convulsions has been widely adopted, and Kiwisch especially has asserted that eclampsia never occurs without "pains". That this however is incorrect, is shown by the numerous instances in which attacks have been observed during pregnancy; and if it is insisted that these are always cases of incipient premature labour, and that the first feeble uterine contractions were overlooked, we may point to the counter observation of convulsions with a perfectly quiescent uterus. On the other hand it is true that *paroxysms, occurring during pregnancy, are soon followed by parturient activity*, even although, as already mentioned, this may under favourable circumstances again become arrested; and it is also true that where the disease (*i.e.* the toxæmia) is present, the uterine contraction may furnish the actual causal stimulus for the attack. I have been able distinctly, and more than once, to observe this, after expulsion of the child and after-birth, when the uterus had been mechanically stimulated, with the object of expressing the placenta or inducing vigorous contractions. The actual pains are not directly affected by the disease; but it has frequently seemed to me as if the period of dilatation advanced more slowly than it usually does, under otherwise similar conditions; on the other hand I, like others, have often seen the period of expulsion progress very rapidly, indeed precipitately. I have never met with tonic spasm of the uterus, *i.e.* a condition in which the latter shared in the muscular irritation.

The characters of the *urine* deserve special attention. Except in rare cases it is highly albuminous, contains abundance of renal epithelium (which has often undergone fatty degeneration, and may form casts), frequently the so-called fibrin casts, and not uncommonly blood; in several of my patients the proportion of urea was found to be remarkably diminished. Further, in all serious cases the *amount of urine is very small*, and then the secretion is always turbid, dark and contains much albumin, epithelium and numerous urinary casts, sometimes blood-corpuscles. On the other hand the bladder may be quite empty for hours at a time; there may be complete anuria.

§ 662. *Terminations.* The disease scarcely ever ends in *recovery*, except after delivery. The paroxysms become rarer, shorter, and milder during and after the latter, and sometimes cease entirely with the expulsion of the ovum; the pulse and

respiration grow quieter, a warm perspiration breaks out, and the coma gradually passes into uninterrupted quiet sleep. Consciousness too gradually returns, the senses however continuing dull. The woman knows nothing of what has befallen her; sometimes the whole period of her gestation, although most frequently only the act of parturition, seems to have entirely faded from memory, and is only gradually recollected. The œdema and albuminuria disappear very rapidly; it is the exception for some kidney mischief to remain.

Even when the danger which is directly associated with the convulsions, is over, *sequelæ* by no means uncommonly still threaten the life of the woman, or prevent her complete restoration. In the first place copious *hemorrhage after delivery* is to be dreaded. The proclivity of eclamptic patients to this may possibly depend on the albuminuria, or on the non-aërated condition of the blood caused by the attacks; but at any rate its existence has been shown by several of my cases, as well as by the experience of others (*cf.* Johnston and Sinclair's Reports of the Rotunda Lying-In Hospital). Then again all observers are agreed that women who have suffered from eclampsia, are more liable to the ordinary *puerperal diseases* than are other lying-in women; and this is in no small measure due to the operative measures, which are so often necessary during labour. Other sequelæ that have been observed, are severe anemia and nervous disorders, hemiplegia, amaurosis, a feeble mental condition, psychical affections and above all mania¹. I have once met with aphasia where the psychical condition was otherwise healthy. Mendel (*Monatsschrift f. Geb.*, xxxiii., p. 431) observed it in a case in which a cerebral lesion was afterwards discovered.

A by no means small number of women *die* at the time of the attack, either before the completion of delivery, or soon after it. Death during the attack may be due to cerebral apoplexy, but is still oftener produced by the acute asphyxia consequent on the respiratory spasm. Or else it occurs during the comatose condition, as a result of the exhaustion of a previously unduly excited nervous system, and of the deep carbonic acid poisoning which is gradually induced by the attacks; it has also been caused by structural lesions of the brain. Bailly (*Archiv. de*

¹ *Cf.* Seydel, *Vierteljahrsschrift f. gerichtl. und öffentl. Medicin*, 1868, ix., p. 317; Frits, *Thèse de Strasbourg*, 1870.

Tocologic, 1875, p. 43) has recorded a case which shows that suffocation may be produced mechanically by the swollen and enlarged state of the tongue.

The *necropsy*, generally speaking, reveals nothing that could throw light on the disease, except a (usually) moderate degree of renal mischief; and even the kidneys may appear to be healthy with the exception of trivial insignificant changes. Occasionally apoplectic extravasations or their remnants are found, as well as hyperæmia of the cranial cavity, and capillary extravasations; but it is more common to meet with cerebral anæmia with a copious serous transudation into the brain, and especially into its membranes; hyperæmia of various organs and serous transudations have also been observed, the latter especially affecting the lungs.

§ 668. The *prognosis* is always serious, for eclampsia ranks as one of the most dangerous complications of labour. On an average out of every 3—4 women attacked 1 dies (Dohrn's collection of 747 cases yields a mortality of 29 p. c.); the proportion was formerly still more unfavourable, but has decidedly improved with more recent observations, owing no doubt to our clearer insight into the nature of the disease, and to a more rational treatment. Speaking generally, the danger is greater, the earlier during pregnancy and labour the paroxysms break out, the longer it takes to complete the expulsion of the child, the more difficult the delivery, the more numerous the attacks, the more rapid and deep the development of the comatose stage, and the greater the renal inadequacy. S. Thomas's¹ statistics prove that multiparæ run a greater risk than primiparæ, and the same is also said to be true of robust, muscular and full-blooded persons, as compared with the more delicate. Concomitant disease of the respiratory and circulatory organs forms a very serious complication.

The mortality of the *children* is very high; probably half of them perish during, or soon after, birth. The cause lies less in the toxæmic condition which produces the disease, than in the accumulation of carbonic acid in the maternal blood, caused by the attacks, as a result of which the aëration of the foetal blood is prevented. The fetus therefore dies from asphyxia and its effects, as is moreover shown by the post-mortem appearances.

¹ Cf. Schmidt's *Jahrbuch* vol. 149, p. 296.

The prognosis for the child therefore bears a direct relation to the number and severity of the attacks. But I need hardly add that the mode of delivery has a by no means unimportant influence.

Pathology and Etiology.

§ 664. The aetiology of eclampsia has only come to rest on a sure basis, since the discovery that the disease is almost invariably accompanied by an interference with the renal functions. When Lever first showed in 1848 (Guy's Hospital Reports) that the urine of eclamptic women is almost always strongly albuminous, and that the changes, which occur in Bright's disease, are also found in the kidneys of eclamptic women, the inference was naturally drawn, that eclamptic convulsions, like those of uræmia due to nephritis, were caused by retention of urea in the blood. Frerichs enunciated this doctrine most clearly, and tried to prove it experimentally. His teaching culminates in the statement that when the elimination of urea through the kidneys is interfered with, that substance undergoes decomposition in the blood into carbonate of ammonia, and that the accumulation of the latter in the blood is the cause of the convulsions in the cases in which eclampsia is accompanied by renal mischief.

This theory, which would attribute eclampsia to ammoniæmia, was less questioned by obstetricians than by pathologists, the opposition of the latter being based partly on the different views that are held in regard to uræmia, but principally on the absence of evidence that ammonia is present in the blood. That it may however be so present, I have shown by the careful investigation of a case; although additional observations usually gave a negative result. Only twice afterwards could we again demonstrate the existence of ammonia in the blood, and in both instances the quantity was so small that the effect we are here discussing, could not be ascribed to it. *Ammoniæmia must therefore be regarded as one of the rarest causes of the convulsions.*

This of course does not disprove the view that eclampsia is due to uræmic intoxication. For we know now that the latter does not depend upon the toxic action of a single constituent of the urine, but on the retention in the blood of all the substances which should be excreted by the kidneys.

§ 665. The objections which are raised against the theory of

uræmic poisoning are the following: (1) a woman who has suffered for some time previously from Bright's disease, not uncommonly escapes eclampsia; (2) in many cases of the latter the changes found in the kidneys *post mortem* are very slight, or even absent; (3) eclampsia may, as already stated, occur without albuminuria, or the latter may only set in after the convulsions.

These objections have led many to support Rosenstein's theory, a modification of Traube's view as regards the origin of uræmia. According to this theory, eclampsia only arises (much as do the nervous symptoms in ordinary uræmia), when in a very hydræmic person the aortic pressure is suddenly raised. Under such circumstances acute œdema of the brain is supposed to result; the transuded serum compresses the cerebral vessels, and leads to acute cerebral anemia. If this alteration is confined to the cerebrum, coma will follow; should the middle brain be involved, there will be convulsions.

The attractive feature about this hypothesis lies in the facts *a.* that the required increase of arterial pressure might be brought about by the pains, which increase seems to explain many of the symptoms of eclampsia, and *b.* that many observers hold that hydræmia exists in all pregnant women. But the theory breaks down (as Hecker has already shown, *cf. l. c. sub Literature*), for the reason that it utterly fails to explain why eclampsia is so rare, while the pathogenic conditions are supposed to be present in the majority of cases; something more is therefore required to set the paroxysms going, and this something is not supplied by Rosenstein's theory. Moreover the hydræmia which is held to be a *sine qua non*, does not exist in most eclamptic women; indeed they are often young, vigorous individuals, and conversely the great majority of really hydræmic individuals do not suffer from eclampsia, so that in such cases both hydræmia and an increase of arterial pressure do not cause œdema of the skin and brain. Again, œdema is by no means a constant feature in the corpses of eclamptic persons; where present, it may quite well be secondary, much as may the transudation into the serous cavities. This theory further does not explain the eclampsia of pregnancy and the post-partum state. Finally, the clinical signs of cerebral pressure due to œdema are absent, and the condition of the pulse and pupils in no way corresponds to that generally accompanying such pressure.

§ 666. In opposition to this entirely hypothetical theory of Traube and Rosenstein, we must cling to the central idea, that *the disease is of the nature of uræmic poisoning*: a view which is not only plausible in virtue of its simplicity, but which explains all the symptoms, and harmonises with all our experience. Nor are the objections to it by any means insuperable. The *first* one viz.: that a pregnant woman who is suffering from diffuse chronic nephritis sometimes escapes eclampsia, does not go for much. For such renal disease may be present and even have lasted a considerable time, without preventing the still healthy portions of the two kidneys from secreting sufficient urine to keep off toxæmia. Eclampsia again, it must be remembered, mainly depends upon an acute affection of the entire renal parenchyma, which owing to its rapid development produces complete, or nearly complete, suppression of urine. And if, in consequence of chronic nephritis, the organs are utterly inadequate to do their work, or if they rapidly become so as a result of pregnancy, paroxysms will break out during the latter.

Such a sudden interruption of the secretion of urine, associated with the complete retention in the blood and tissues of all the substances which are intended to be excreted, must obviously exert an extremely pernicious influence, and is quite sufficient to explain the eclampsia. Most stress must therefore be laid upon it. Moreover that such an interruption does occur, is proved by the exceedingly small quantity of urine that is invariably secreted in these cases; in the worst ones the bladder is almost, or entirely, empty, so that complete suppression exists till the remission of the disease. Further evidence is supplied by the considerable increase of the urea contained in the blood, which I have repeatedly found in the last-mentioned class of cases. This acute renal incompetency may also develop in women who have hitherto been healthy, and thus may be explained the unexpected onset of the paroxysms in persons, who till then have been quite well, or who have only shown premonitory symptoms for a very short period. This view moreover cuts the ground from under the *second* objection, viz. that in many cases of eclampsia the pathological changes in the kidneys are extremely slight, or even entirely absent. For the complete arrest of the secretion of urine can only depend on disturbance of the circulation through the kidneys, or on some rapidly developing affection of their vessels,

and such a disturbance need not leave any definite traces *post mortem*, and, where recovery ensues, may disappear as rapidly as it appeared. This is the only view that explains the numerous instances in which, as soon as the paroxysms subside and recovery occurs, all the renal symptoms disappear, and rapid and complete restoration follows.

§ 667. The reader will gather from the above that *I refer the outbreak of convulsions, in all women who have not previously suffered from diffuse nephritis, to an alteration in the renal circulation*, and this obliges me to explain what I mean by the latter. The existence of a state of simple venous engorgement, such as might be caused by the pressure of the gravid uterus on the renal veins, cannot be admitted for the great majority of cases. The uterus can scarcely ever exert such a pressure, while where the latter is actually present (*e.g.* owing to large pelvic and abdominal tumours), the ureters are more apt to be affected than are the renal veins and the vena cava; lastly, at the autopsy of eclamptic women no trace of renal engorgement can as a rule be found (indeed the kidneys are much oftener markedly pale and bloodless). *The alteration therefore must be in the vessels themselves, more particularly in their terminations.* What its exact nature is I am of course unable to say. Possibly there may be some alteration in the walls of the vessels, which prevents diffusion, and this view would seem most probable in the cases where prodromal symptoms exist; or the disturbance might merely consist in a spasm of the vessels, which suddenly arrests the flow of blood to the kidneys, and under such circumstances the cause of the disease would have to be sought in the vaso-motor nerves. Now we know¹ how sensitive the secreting epithelium of the kidneys is to even brief interruptions in the blood-flow, and that even after temporary closure of the renal artery, the secretion of urine ceases for a considerable time, sometimes for as much as three quarters of an hour (Overbeck), so that the renal epithelium evidently needs to be regularly and uninterruptedly nourished by the blood, if it is to carry on its secretory functions. Spasm of the arteries will entirely arrest secretion and, if it occurs repeatedly, will kill the epithelium, and cause the constituents of the urine to be retained in the blood.

¹ C. Heidenhain, *Breslauer Aerztlich. Zeitschrift*, 1879, No. 22; also Hermann's *Handbuch der Physiologie*, v. 1.

A similar influence of the vaso-motor nerves is known to exist in the case of other organs. There are moreover other signs which indicate that such an irritation exists in eclampsia. I need do no more than refer again to the wide and sluggish state of the pupils at the beginning of the attack, and to the spasm of the cutaneous vessels. This irritation may possibly affect the cerebral vessels also, leading simultaneously to cerebral and renal anæmia. Nevertheless such a supposition is not necessary, since the irritation of the brain is fully accounted for by the uræmia. It is not improbable that the vaso-motor irritation proceeds from the uterus; indeed the association of some special irritation of the sensory nerves of the uterus with the convulsions, has been frequently and properly pointed out; and if we suppose that the vaso-motor nerves of the kidneys, which run in the splanchnic nerve, can be irritated in a reflex manner by the uterus, we also get over the difficulty, which lies in the undoubted causal connection between uterine contractions and convulsions.

Nor need the more incidental causes of irritation be excluded by the view that is advocated above. For example there is the influence of primiparity¹ (especially when such operates at a quite early, or at a somewhat advanced, age), in which the nervous system is, generally speaking, more irritable than in a subsequent pregnancy. I may also mention the influence of great distention of the uterus, of severe bruising of its lower segment (eclampsia is particularly common in twin pregnancy, although not, as a glance at the recorded cases shows, in hydramnios; it is also common, where the pelvis is contracted²); and especially atmospheric influences, whose importance was insisted upon in olden times, and has also been so by Smellie, Denman, Ramsbotham, Duges, Andral, Simpson and Rosenstein. These influences especially affect the skin, an organ whose relations to renal activity are of course well known, and possibly explain the occasional occurrence of a group of cases, the *quasi* epidemic occurrence of eclampsia.

In discussions relating to the pathogenesis of the disease, great weight has almost invariably been laid on the increase in arterial pressure, and there can be no question that it exists.

¹ According to Hecker (*Beobachtungen und Untersuchungen*) and Löhlein 85 p.c. are primiparæ; Winkel (*Pathologie des Wochenbettes*, 3rd ed.) says 77 p.c.

² Cf. Löhlein, *Zeitschrift f. Geburtshunde und Frauenkrankheiten*, i., 1875, p. 64.

It may be caused merely by the renal incompetency, and must necessarily, where that is present, increase with every pain and with the co-existing muscular effort. But it is not a causal element of the disease, not even of the individual attacks; at most has it an aggravating influence.

§ 668. I must now deal with the *third* objection to the theory of uræmic poisoning, viz. that eclampsia may occur without, or only be followed by, albuminuria. Such cases however are on the whole very rare, and a certain number of them can undoubtedly also be explained by the uræmic theory. For renal incompetency may develop very rapidly, and under such circumstances the urine would of course be previously quite free from albumin; if it now, scanty though it be, gradually becomes albuminous, that fact in itself is hardly sufficient to prove that the albumin is a result of the convulsions; it is much more likely a result of the interruption (even when this is only short) of the renal circulation, a result of the alteration in the renal blood-vessels.

Nevertheless there remain some cases, and I myself have met with such, in which there is no albuminuria throughout the whole course of the disease, or in which merely traces of albumin occur for a short time. Such exceptional cases must be distinguished from the ordinary run of eclampsia as a special variety, and require to be differently explained. Excepting in the rare instances in which convulsions are caused by serious mischief in the brain¹, the best plan is to designate these attacks by the name of *eclamptiform*, and to regard them as due to a reflex irritation of the vaso-motor and convulsive centres by some peripheral stimulus. They may then be grouped in the same category as the epileptic attacks which can be artificially induced, and the epileptogenic zone would here be the ramifications of the pelvic nerves (in the experiments that have been made bearing on this point, cf. Brown Sequard, the sciatic nerve plays the principal part). Further, there are many facts (cf. Hecker, *l. c.*, Wernich, *l. c.*) which show that the nerves of the generative organs actually correspond with very important peripheral areas of irritability, which may act as so-called

¹ Cf. the interesting case recorded by Hecker (*Beobachtungen und Untersuchungen*, p. 79), in which a sarcoma as large as a hen's egg and of a colloid appearance was found in the right cerebral hemisphere.

epileptogenic zones. It would then merely be necessary in any case of eclamptiform paroxysms to demonstrate some unusually great irritation in the pelvis, although the possible existence of individual proclivity or of special irritability would also need consideration. In a case of such convulsions which I have seen here, the source of irritation probably lay in the urinary bladder, which had undergone enormous distention, owing to the head being detained for a long time in the pelvis.

The parturient woman was at the full term and a primipara (Case-books 1870—71, No. 116). She was seized with the first paroxysm 12 hours after the somewhat premature discharge of the liquor amnii; the second occurred soon after the arrival of the medical attendant. Owing to the head lying low in the pelvis and to its compressing the urethra, he was unable to evacuate the greatly distended bladder, but extracted the head with the forceps. The accumulated urine immediately gushed forth (a sufficient quantity was drawn off with the catheter), and proved to be entirely free from albumin. The child lived. There was no return of the paroxysms, and the lying-in woman rapidly recovered.

§ 669. In order to avoid all misconception of this subject, I may conclude by summing up the previous discussions in the following way :

True eclampsia depends upon uræmic poisoning, due to an inadequate secretory activity of the kidneys. The latter either arises from renal disease which has lasted some time previously, and which attains a dangerous degree of severity owing to the gravid or parturient condition. Or else in women who have till then been healthy, it develops more or less rapidly (although always within a short space of time), and is then with great probability caused by an acute affection of the renal vessels; certain it is that complete anuria may set in quite suddenly through spasm of the vessels, and this vaso-motor spasm is to be looked upon as caused in a reflex manner by irritation of the uterine nerves. The increase in the arterial pressure which is present at the onset of the paroxysms, is a consequence, and aggravates the disease.

The cases of eclampsia without albuminuria form a special group; they are acute epileptic attacks, the area of distribution of the sciatic nerve being the epileptogenic zone. This form of disease is rare, and as a rule only provokes slight attacks.

Diagnosis.

§ 670. The diagnosis of eclampsia may be arrived at, when renal disease and the aggregate of symptoms which have been described above, are found to be present simultaneously. In actual practice however it is not always possible at once to examine the urine, while moreover albuminuria may now and then be absent. Under such circumstances eclampsia might be confused with an epileptic or hysterical fit, or with similar convulsions due to apoplexy or acute anemia.

An *epileptic condition* is generally revealed by the previous history of the woman. The coma too after the epileptic attack is never so prolonged; consciousness returns more quickly, and the intervals are greater than in eclampsia. Lastly, the pulse during a fit of epilepsy is quite different, and indeed but little affected. There is either no rise of temperature at all, or what there is, is less marked than in eclampsia, where the temperature increases with every attack, and even during the intermissions does not return to normal, until the paroxysms have permanently ceased.

In *hysterical convulsions* consciousness is never altogether abolished; indeed sensory activity is as a general rule actually increased, so also is reflex irritability. The paralytic stage is entirely absent; at most are the attacks followed by a sense of relaxation and fatigue. Generally speaking, the whole aspect of the case is in harmony with the nature of the attack.

With a little care eclampsia may be distinguished from the convulsions which sometimes precede death, in case of *copious hæmorrhage*. Mistakes however may occur, as I have myself witnessed in a woman whose uterus was distended after delivery through enormous internal bleeding, which distention the midwife attributed to the presence of a second child.

The comatose condition which follows an eclamptic paroxysm, has unquestionably some resemblance to the stupor of an *apoplectic attack*: nevertheless the prolongation of the comatose state after the latter, together with the unilateral paralyses and localised twitchings, will probably remove any doubt.

Lastly, coma due to deep *drunkenness* may simulate that caused by eclampsia, as was shown by two cases brought into this hospital. The women, one advanced in pregnancy, the

other parturient, had made themselves drunk in order to escape the suffering associated with the "pains". Of course the smell of the breath and of the vomited matters at once revealed the condition of things.

Treatment.

§ 671. The question of *prophylaxis* can only arise, where there is disease of the kidneys, or where prodromal symptoms have shown themselves. In the former case the renal secretion must be encouraged by alkaline diuretics or vegetable acids; the skin must be made to act by warm baths, the bowels by purgatives, so as to lessen the work for the kidneys, while the impoverishment of the blood must be counter-acted by tonics, *e.g.* iron. Where there are distinct premonitory symptoms of an eclamptic attack, a moderate venesection may even now be performed, and narcotics administered (chloral hydrate *per rectum*, or morphia subcutaneously); the vegetable acids recommended by Frerichs are also valuable, especially benzoic and citric acid, which in addition to their diuretic action are supposed to have the power of rendering innocuous the carbonate of ammonia that may be present in the blood. The induction of premature labour on the other hand which is sometimes advised, is not a good proceeding, since the onset of the paroxysms is never a matter of certainty, and since the parturient activity that is thereby called forth, may actually provoke such outbreak. Of course albuminuria and the cause at the bottom of it, as well as its sequelæ, may justify the operation, but the indications will then be altogether different.

If there is reason to fear eclampsia in a parturient woman, the same course should be adopted as with premonitory symptoms before labour. Careful supervision may here be of great service.

§ 672. The treatment of an actual outbreak of the disease follows from the various considerations which have been given above, and must therefore mainly act in three directions. It must aim at restoring free functional activity to the kidneys, at lowering the arterial pressure which has been raised by the suppression of urine and the convulsions, and at avoiding any irritation which might excite the vaso-motor and convulsive centres, or at any rate at making it as feeble as possible. These

objects are best attained by venesection, narcotics and, if the patient is parturient, by terminating labour as quickly as is practicable. These are the most reliable means we possess of combating the disease, and of speedily attaining a successful issue. All the others which have been recommended, are subsidiary, and where they have a favourable action, only act on the lines already mentioned. I need hardly add that sometimes one method, sometimes another will be preferred, according to the circumstances of each case. Even the most special directions will only prove general ones, when they come to be applied.

§ 673. As far as my experience goes (and it corresponds with that of older authors and of most practitioners), *venesection* ranks first in the treatment of *true eclampsia*. Nor are there any theoretical objections to it. There is no other way of so rapidly and certainly lowering arterial pressure, none has such power of restoring to the kidneys, so sensitive to any alteration in the blood-pressure, their functional activity; few have such a sedative influence on the irritated vaso-motor nerves. I therefore advise the practitioner as soon as he sees his patient after the first outbreak, to open a vein in her arm, and to abstract at least grm. 200 (7 oz.) of blood. In very robust individuals I have not hesitated to bleed to the extent of grm. 500 (17 oz.), and I have never regretted doing so. Indeed should the removal of this quantity produce no marked effect, or should the latter only be very temporary, and after an interval which must depend on the condition of the woman, the venesection may be repeated. The moment at which it is well to stop bleeding, must depend on its effect, and on the state of the individual concerned. In *eclampsiform attacks* on the other hand venesection is unnecessary. Here narcotics will suffice, especially as this kind of fit almost always occurs at a time at which labour can rapidly be terminated.

Narcotics should be given soon after the venesection, if a fresh attack comes on, or even with the object of preventing such. Amongst them *chloroform* is the one which most surely and speedily fulfils the indications of lowering the blood-pressure, soothing the convulsive centres, and suppressing the accidental reflex-acting causes. True, in order to obtain these results, it is necessary to induce complete narcosis, and hence chloroform is not quite free from risk, especially if given soon after the venesection; indeed

it may lead to sudden death, as happened in an instance known to me. Bearing this in mind therefore, it is wise only to allow inhalation during the paroxysms, and since this is usually rendered difficult by the accompanying restlessness, the administration should be begun with the first signs, which announce the approaching attack (the *aura*). By this means the latter may often be cut short, or at any rate diminished in severity. If the inhalation is stopped, when the convulsive movements cease and during the intervals, no dangerous accumulation of chloroform in the blood need be feared.

It is sometimes a good plan to combine the use of *morphia* or *chloral* with that of chloroform, the first being administered subcutaneously, the second *per rectum*. These two remedies increase the action of the inhalation, and when they are used, narcosis sets in more readily and rapidly. But even apart from chloroform they are of help in lessening the intensity and diminishing the number of the paroxysms; and since meanwhile the pains continue to act much as before, we have gained a great deal. The dose however must not be too small; it is well to begin with at least grm. .015 (ca. gr. $\frac{1}{4}$) of *morphia hydrochlor.* and grm. 3 (gr. xlv) of *chloral hydrate*, and these quantities can be repeated at suitable intervals. Which of these two remedies deserves preference, is still uncertain; *chloral* is very highly spoken of by those who have used it, and its beneficial effect might be expected from the relation it bears to chloroform; *morphia* is more likely to be at hand, and I have always succeeded well and been satisfied with it.

The earlier this method of treatment can be begun, the better. Indeed whenever an attack has occurred a short time before, or soon after, the venesection, a full dose of *morphia* or *chloral* should be administered without delay. The time for ceasing to give narcotics, is that at which no further paroxysms occur, or the paralytic stage is fully developed. Where the remedies have been carefully exhibited, no injurious result has occurred in my experience. The risk of subsequent hæmorrhage which has been mentioned by some authors, does not exist; the liability to it, which is present in all eclamptic patients, may have led to such statements. If the uterus is kept under careful and strict supervision after delivery, its relaxation may be prevented or kept under control.

§ 674. I have already stated that the various other remedies that have been proposed, cannot take the place of those just mentioned; they are at best only subsidiary. Jacquet¹ has lately recommended (and Porter² has since done so) that the skin be made to act vigorously, that *diaphoresis* be encouraged, and this is doubtless a rational proceeding, although it can only be relied upon in minor cases. Its value consists mainly in the fact that it can be used continuously throughout the whole illness, while at the same time it is especially suited to the comatose stage, and to the lying-in period. The best way of applying this method is to wet pack the whole body at a temperature of about 22° C. (72° F.), according to Priessnitz' system.

During recent years *pilocarpin* has been largely used hypodermically. It should however only be administered at the beginning of the illness, *i.e.* before coma has set in; otherwise if there is loss of consciousness and of reflex irritability, the reflux of the abundantly secreted saliva and the copious secretions of the mucous membranes lining the air passages, might lead to dangerous symptoms of suffocation, as is shown by the observations of Säger and others, and also by a case in my hospital (*cf.* Kroner).

Purgatives are as rational as diaphoretics; like the latter, they lower arterial tension, and lessen the work of the kidneys. If the patient can swallow, a full dose of jalap root with calomel grm. .5 with grm. .25 (gr. viii with gr. iv) may be given; if not, a drop of croton oil may be placed on the back of the tongue. An injection of castor oil with oil of turpentine (a table-spoonful of each in chamomile tea) can always be given.

Fearn³ has recommended *veratrin*, as a substitute for venesection, and bromide of potassium, as one for narcotics. Further information however is wanting in regard to these as well as to similar remedies, nor is it likely that we shall obtain it in face of the more reliable methods given above.

The application of *cold to the head*, or the abstraction of blood from the latter, may be used during coma; *epispastics* are not good, since they might excite reflex convulsions. During the

¹ *Cf. Berliner Beiträge z. Geburt.*, i., 1870. *Sitzungsbericht*, p. 100.

² *Cf. American Journal of Medical Science*, July, 1873.

³ *Cf. American Journal of Obstetrics*, iv., p. 28. Also Boyd. *American Practitioner*, Jan., 1878.

paralytic state, *stimulants* must of course be resorted to, but they will rarely do much good. *Diuretics* (potassium salts, vegetable acids, gum benzoin) are only suited for the subsequent stage, that of convalescence.

§ 675. During an attack all tight articles of clothing must be removed, and the patient prevented from hurting herself. She must either be kept on her bed (although without the use of undue force), or else laid on a mattress on the floor. The tongue must be guarded from the risk of being badly bitten, and the teeth from breaking off, by interposing soft cloths between the latter, or by winding some soft material thickly round the handle of a spoon. If, as often happens, a paroxysm takes place, just as venesection is being performed, the wound must be compressed with the fingers in order to prevent an excessive loss of blood, as well as to keep the woman and her surroundings from being bespattered with it. The carotids also may be compressed in order to cut short the attack, as Trousseau has proposed in the eclampsia of children.

§ 676. The third indication which we laid down above, was that *labour should be terminated as rapidly as practicable*. It is evident that the evacuation of the uterus, the consequent rapid diminution of the intra-abdominal pressure, the associated loss of blood, and the removal of the principal factors which provoke the disease, can have nothing but a favourable influence on the latter; indeed they generally remove the ætiological elements. This would be true, quite apart from the additional proof which is supplied by clinical experience. The fact that paroxysms by no means infrequently occur after delivery (although they are as a rule only single ones), or the fact that occasionally no paroxysms occur until the post-partum period, cannot be regarded as valid arguments against the correctness of this indication. But the condition of the uterus must be such as will allow of its rapid and easy evacuation, the operation must not act as too strong a stimulus, nor must it, as has happened, seriously damage the mother and her fetus, possibly even more so than the disease itself would do. It is only under these conditions, that the course we have suggested should be adopted.

Hence when an outbreak occurs *during pregnancy*, there can be no question of obstetrical interference, i.e. of the induction of premature labour. For in the first place the con-

vulsions may again subside without interrupting pregnancy. Secondly, if the disease is at all severe, labour will set in *sponte*. Thirdly, all the mild proceedings which would suffice for provoking pains, are too slow in their action, while those that operate more rapidly irritate the uterus too greatly, and will therefore merely aggravate the disease. Forced delivery is entirely forbidden under these circumstances, *i.e.* while the cervix uteri is still totally unprepared; it is a formidable operation, which as a rule can only be accomplished by sacrificing the child, and severely damaging the parturient canal.

The case however is altogether different, when once *distinct parturient activity has set in*; our one object must now be to promote such activity. The best means of effecting this is to catheterise the uterus and to introduce a Tarnier's bag into its lower segment; colpeuryesis is too irritating, while repeated warm irrigations are difficult to administer under these circumstances. When the cervix uteri has become sufficiently softened and wide, the liquor amnii may be allowed to escape; the diminution in pressure which accompanies its discharge, frequently has a very useful influence. By this time moreover, if the danger increases and the early spontaneous progress of delivery still seems a long way off, it will be permissible to dilate the os artificially, so as to allow the child to be rapidly extracted, either by its presenting part or after version. Dilatation by the hand is preferable to incisions, for the latter generally tear beyond the cuts, as far as is necessary to allow the introduction of the hand. This kind of accouchement force, when carried out cautiously and not too precipitately, is only "forced" in appearance, while on the other hand its good results are sometimes quite remarkable. It is a good plan to perform this operation in the stage of sopor, or soon after a paroxysm, since the irritation that is associated with the operation, will then be less likely to provoke a fresh seizure. But considering how divergent are the views still held as regards active or expectant treatment, I feel bound again to point out that (in harmony with the principles which I have been advocating) I only recommend the former, where it appears to be absolutely demanded by the urgency of the condition.

The further labour has progressed, the more desirable it will be to terminate it artificially, since this can then be done with greater

ease and less risk. Which method of procedure is selected, will depend on the circumstances. Indeed when the convulsions only break out, just as the child is about to make its exit, the best plan may be to let matters take their own course, provided that the labour seems likely to terminate rapidly. Even then however the practitioner is much more likely to regret having waited, than he is having operated, especially as at this period interference is free from danger. The welfare of the child will in any case call for artificial assistance, provided it is still, as is usual, uninjured.

Complications, especially pelvic contraction, will of course modify the course of treatment, which I have advised, in accordance with the special rules that apply to them. Broadly speaking however, they will more than ever make an active course necessary. I have mentioned in §§ 269—270 what should be done, if the patient is in danger of dying, or has died, undelivered. Here, all measures which in any way imperil the child, are, more than ever, out of place.

§ 677. If the eclampsia continues *after delivery*, or only breaks out after it, the placenta and any large clots that may remain in the uterus, and that might give rise to reflex irritation, must be rapidly removed. The abstraction of a small quantity of blood by venesection, narcotics, diaphoretics, purgatives &c. are here called for. Sequelæ must be treated according to their characters.

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Treatment: Chloral hydrate, Chapppe, *Annal. Gynec.*, v., 1876, p. 33; *Pelocarpin*, cf. Fehling, *Centralblatt f. Gynäkologie*, 1878, p. 196; Prochownik, *ibid.*, p. 262; Böhler, *ibid.*, No. 15; Straynowsky, *ibid.*, p. 480; Schramm, 1879, No. 13; Sanger, *ibid.*, p. 559; Krömer, *Archiv f. Gynäk.*, xv., p. 195. *Obstetrical Treatment*: Fehling, *Würtemb. Med. Corr.-Blatt*, 1876, vol. 46, No. 2.

2. *Hæmorrhage from the Uterus.*

§ 678. Hæmorrhage from the generative organs, occurring during the course of delivery, may either be due to injuries of the uterus, vagina or external parts, or to laceration of the umbilical vessels, or else it is derived from the placental site.

Traumatic hæmorrhage is not so often associated with injuries of the body of the uterus, as with such of the actual parturient canal, especially of its lower portion. I shall describe it further on, in the chapter dealing with "Ruptures" (§ 719 *et seq.*), but may here mention that only in exceptional cases is it so copious as to cause anxiety, although its possible occurrence should always be thought of, when the usual causes of placental hæmorrhage are not present, or when the symptoms do not distinctly point to the latter. The nature of this hæmorrhage is very frequently mistaken.

"Presentation" of the Umbilical Vessels.

§ 679. Hæmorrhage from the umbilical vessels is still rarer. A rupture of one or more of these can of course only occur, where there is *insertio velamentosa*, or where a *vas aberrans*¹ runs in the membranes, and even then only when the umbilical vessels ramify within the segment of the membranes which forms the bag of membranes (lying within the os), when the vessels "present" (*vasa funiculi umbilicalis previa*—Huter), or when the *vas aberrans* takes such a course.

Even then the blood-vessel may escape injury, since the *vasa previa* may be long enough to enclose the ruptured portion of the membranes between them, and to allow the child to pass through the os by pushing the vessels to either side*. Or else the lacerated vessel may be very small, and so thoroughly compressed by the advancing child that neither hæmorrhage nor other mischief result. As a rule however, where this anomaly exists, a somewhat large vessel ruptures; relatively copious hæmorrhage follows, and the child comes into the world still-born, and with the signs of anaemia. I have already pointed out (§ 373) that the very compression of the lacerated vessel, which prevents

¹ Cf. Ruge (*l. c.*); Valenta, *Memorabilia*, xix., 1874, p. 197.

² Ruge records an instance of this, p. 47; cf. also Kuhn, *Wiener Med. Presse*, 1887, No. 23.

copious hæmorrhage, may asphyxiate and kill the fetus; and this result of course may occur without rupture of the vessels, and even before the rupture of the membranes.

In exceptional cases vasa prævia may be diagnosed, *i.e.* when they run through the segment of the membranes that lies within the os, and are readily accessible to the finger, and when it is possible to feel at that point a pulsating, moderately thick cord, which cannot be pushed about in the liquor amnii. But unless care is taken, the condition is apt to be confused with a presenting noose of the cord (Hüter).

In all these cases the rupture of the membranes must be delayed by every expedient, and for as long as practicable, so that the child may be extracted immediately after such rupture. The child is always endangered, when the membranes have burst, whether there is hæmorrhage or not. Occasionally it will be possible to prevent injury to the vessels, by artificially opening the bag of membranes at a less exposed spot, and drawing the vessels to one side; but of course this can only be done, if the passages are sufficiently prepared. If the fetal pulse then continues unaltered, labour may be allowed to progress spontaneously, provided that pulse is kept under constant observation. When rupture has occurred and hæmorrhage set in, this anomaly can no longer be confidently diagnosed, unless it was so previously; we can then only treat the symptoms, according to the circumstances of the individual case and to the most probable diagnosis.

Hæmorrhage from the Placental Site.

§ 680. The commonest source of hæmorrhage is the placental site. The cases in which the bleeding *precedes* the birth of the child, *i.e.* is due to the premature detachment of the placenta (whether this was inserted normally, or into the lower segment of the uterus), have already been described under the Pathology of Pregnancy, *cf.* §§ 423—44. Here I shall merely deal with

Hæmorrhage following the Birth of the Child.

This kind of hæmorrhage may occur either before, or after, the expulsion of the placenta, and occasionally still later during the puerperal state. The last variety is distinguished from the

placental, as *secondary hæmorrhage* (cf. § 801); in this place I confine myself to the former.

This kind of hæmorrhage is often supposed to be due to anomalous detachment and expulsion of the placenta; but ætiologically the latter conditions do not deserve the important rôle, which is still frequently assigned to them. In fact retention of the placenta and hæmorrhage usually depend upon the same cause; if not, the former is a concomitant as regards causation, and must almost always be referred to the general causes of the hæmorrhage.

Unfortunately post-partum hæmorrhage continues a by no means uncommon complication. I say unfortunately, because owing to the risk of profuse loss it is a very dangerous occurrence, because it, more than almost any other complication, alarms (and well it may!) the woman and her friends, who after the exit of the child think that all danger and cause for anxiety are past; unfortunately above all things because it is almost always a preventable occurrence. Indeed the latter fact cannot be too strongly insisted upon. I certainly do not exaggerate, when I say that severe post-partum hæmorrhage is almost without exception the fault of the attendant. The value of his services can be estimated by the frequency, with which this accident occurs in the labours he conducts.

§ 681. It has already been mentioned that the detachment of the placenta begins during the conclusion of the period of expulsion, and is completed after the birth of the child, by means of a rapid reduction of the area of attachment, and by a rearrangement of the muscular bundles under the influence of contraction; its expulsion is completed through the further contraction of the uterus and abdominal pressure. The line of placental separation passes through the decidua, through its areolar middle stratum (§§ 89, 215); and during this process of separation the blood channels which pass through the decidua, and with it into the placenta must of course be opened, with the effect of causing a momentary bleeding. This however immediately ceases, since the permanent reduction in the size of the uterus, which results from its steady contraction, constricts the opened vessels, and at last with the assistance of thrombosis closes them. This thrombosis however, which is confined to the veins sc. uterine sinuses (thrombosis of the branches or even of

the trunks within the uterine wall is pathological) lying near the surface, would not offer any safeguard, if the relaxation, which follows every individual contraction, always caused the muscular fibres to resume the disposition they had previous to it. But such is not the case. For under normal conditions the new arrangement of fibres is maintained, and constitutes the quiescent condition of the muscle which has become reduced in volume, a condition which has been called by French authors "*tonic retraction of the uterus*." This condition however does not imply that the organ remains tightly and firmly contracted; the latter may again enlarge to a certain extent, and feel comparatively flaccid; nevertheless its retraction and the new arrangement of fibres in it must involve the organ everywhere and uniformly. This fact explains the well known cases in which no hæmorrhage occurs after the discharge of the placenta of a first twin before the birth of the second, those where hæmorrhage is absent, although the placenta becomes prolapsed, or although the uterus again becomes somewhat enlarged, after having been firmly contracted for some time after the detachment of the placenta. All these events are readily explicable, if the *source of the bleeding is borne in mind*.

This source lies not in the arteries, but in the venous sinuses of the placental area. The thick-walled arteries were strongly curled, even before the detachment of the placenta; but after such detachment they retract and become still more curled, this together with their proper contractility closing them completely. The veins on the other hand are short, wide channels, lined with endothelium, without any distinct wall which can be separated from the uterine muscle; nor are there any valves. They run parallel to the placental site, and open several into one at acute angles, so as to form the uterine sinuses. The fact of their running together in this way at an acute angle, leads to the formation of semilunar or sickle-shaped projections, which advance into the lumen of the sinus, and in these again are muscular fibres continuous with those of the uterine parenchyma¹. It is obvious that every contraction of the empty uterus must approximate these projections to one another, and tend to block and narrow the sinuses. Even if the occlusion is

¹ Cf. R. Owen in John Hunter's Works, edited by Palmer, vol. III., p. 68; Goodair, *Anatomical and Pathological Observations*, p. 61.

not quite complete at first, it will soon tend to become so in consequence of the thrombi, which may either already be attached to, or will quickly form on, the projections¹. Now provided that when the active contraction ceases, the muscular fibres retain their fresh arrangement, the resulting condition of the sinuses and the recent thrombosis will also persist. But the contraction must have been uniform and general, otherwise the safety-giving disposition of the fibres will not be attained.

The actual cause of the hæmorrhage is therefore *insufficient contraction of the uterus*. This may either have been too feeble from the very start, or the new arrangement of the fibres which has been momentarily produced, may again yield place to the old, in other words there is no tonic retraction. Or lastly the contraction may have been unequally distributed, and disturb the natural arrangement. We have therefore atony or spasm, and stricture of the uterus.

Both these varieties can be avoided in the great majority of cases, if the placental stage is properly managed (*cf.* §§ 195, 197—199), and we are therefore justified in saying that hæmorrhage and anomalies of the placental stage are almost always preventable; they are either caused indirectly by the want of proper assistance, or directly by injudicious assistance, *e.g.* irritating manipulations. This is proved by the statistics of lying-in institutions, in which this complication is extremely rare. On the other hand prophylaxis does not always suffice; the anomaly is sometimes due to a peculiar condition of the uterus and its placental connections. I now pass on to describe its characters, independently of the ætiology.

(1) *Atony of the Uterus.*

§ 682. Atony of the uterus in most cases affects the entire organ, although sometimes it is confined to the body. In the rare cases in which it takes the latter form, the isthmus, *i.e.* the internal os, is contracted in the ordinary way. Still more rarely is the atony limited to the placental site; this we shall have to discuss separately (§ 695).

The abnormal condition may either show itself immediately after the birth of the child as an insufficient rhythmical contrac-

¹ *Cf.* Vol. i., § 215.

tion. Or else the uterus first of all undergoes the usual great reduction in size, and only subsequently relaxes again and again; there is no tonic retraction. The placenta may meanwhile be entirely separated and even expelled, or remain *in utero*, wholly or partially detached.

Causes.

§ 683. The causes are, broadly speaking, those which have been mentioned for uterine inertia in § 449. In particular we may mention such *conditions of exhaustion* as occasionally occur after prolonged and laborious parturient activity, especially the exhaustion, or so to speak *using up of the uterine muscle*, which is produced after it has been exposed to prolonged pressure, and inflammatory changes have developed in it. To the same, or at least a very similar, category belongs also the condition of the uterus, which is sometimes met with in women, who have had numerous and rapidly recurring labours. Whether a state of collapse (brought on by serious general mischief) or deep psychical depression can lead to an atonic condition of the uterus through want of nervous tone, is to my mind doubtful; but it is said to do so. Further I must not omit, for it ranks as an important cause, the *excessive distention of the uterine cavity* by several fetuses or much liquor amnii, which distention has lessened the tone of the muscle by stretching it mechanically and diminishing its elasticity. Then again a *very rapid emptying of the uterine cavity*, where the abdominal pressure is feeble, and where its deficiency is not made good by the hand of an assistant may be a cause; this is the reason why we more often see atony after hurried extraction (either by the forceps or the hand), than after so-called precipitate labour. In this case the re-arrangement of fibres, which should go hand in hand with the diminution in the cavity, cannot proceed sufficiently rapidly, and the walls of the organ fall in one upon the other. Lastly, the influence of an *alteration in the structure* is most distinct, where the wall is unequally developed and partially atrophied, as occurs when its structure is abnormal, or when fibroids are embedded in it. Under these circumstances however hæmorrhage as a rule only follows, when the placental site is involved by the abnormal formation.

The attainment of such a degree of contraction as is necessary

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for the arrest of hæmorrhage, may be *mechanically* hindered, even when the uterus is endeavouring to contract (relative atony, Kiwisch), through the distention of its cavity by the placenta or clots of blood, which cannot pass out, owing to the internal os being blocked, or to some irregularity in the axis of the organ, or to the whole organ being displaced or altered in shape by the neighbouring organs, or by contiguous new growths : or lastly through abnormal fixation¹. All these conditions interfere with the permanency in the re-arrangement of the muscular fibres, and with uninterrupted retraction.

§ 684. *Irregularity in the formation of thrombi* and consequent hæmorrhage only occur, when the blood is not readily coagulable (purpura, hæmophilia, several acute infectious diseases), or else when the veins passing to the inferior cava are unusually full of blood ; the bleeding which is sometimes seen in patients with cardiac disease may doubtless be explained in this way. It is no doubt also possible for thrombi that have formed, to be again detached and washed away by a sudden rise in the blood-pressure, *e.g.* after heating drinks, or violent movements of the body, and excessive use of the abdominal muscles. But these latter causes will only lead to serious hæmorrhage, when the tone of the uterus is at the same time unsatisfactory. Exceptions to this rule will only accompany quite uncommon pathological conditions, as for instance an abnormal structure of the vessels (possibly aneurysmal), and here hæmorrhage only occurs at a later period of the puerperal state.

Progress of Events.

§ 685. The hæmorrhage may either begin immediately after the exit of the child, or not for a number of minutes ; and either before the expulsion of the placenta (as is the rule), or subsequently to such expulsion, after the uterus has become well and firmly contracted. It may commence as a slight discharge, or as a torrent of blood, sufficient at once to drench the bed, and after soaking through it, or running away over the sheets, to pour down on the floor. If the hand is now laid on the uterus, it will no longer feel the round, firm sphere that ought to be

¹ Cf. Graily Hewitt, *London Obstetrical Transactions*, xi. p. 108 ; Correquer *Graefh's British Med. Journal*, Sep. 28, 1878.

there, but only a soft, doughy and enlarged organ, the margins of which are difficult to define with the hand, and which is sometimes so soft and flabby, that no outline whatever can be discovered. If deep pressure is applied through the abdominal walls, if they are rubbed and kneaded, and through them the flaccid uterus is so also, the latter will contract to some extent, grow more distinct and nodular, but after a short time it returns to its previous condition. During the contractions as well as on the application of external pressure, fluid blood, mixed with clots, is discharged; indeed it not uncommonly is so without such pressure, *i.e.* merely owing to the abdominal pressure. This discharge ceases, if the provoking cause is removed, when the fresh blood that is being effused, begins to re-collect in the interior. The internal examination may show the vagina to be either empty or filled with blood; coagula will be found projecting out of the wide uterine cavity through the flaccid cervix. In the worst cases of atony, it may be impossible to feel the uterus at all through the abdominal parietes, the organ being again distended as at the beginning of labour, and reaching far above the navel, even into the epigastrium, as is shown by percussion. This happens whenever the coagula which are collected in the cavity and especially in the cervix, or when the placenta placed just above the latter, prevent the escape of the effused blood, and thus lead to *internal hæmorrhage*. Where there is this marked distention, a reaction occasionally shows itself in the form of a contraction, causing a quantity of blood to be forced out, greatly to the alarm of the bystanders and of the patient herself; indeed the latter is very apt suddenly to collapse. This internal hæmorrhage is particularly dangerous, inasmuch as it indicates a high degree of atony, since it always involves an enormous loss, and since it is not infrequently only detected in consequence of the constitutional symptoms of hæmorrhage. I remember a melancholy instance of this sort, which occurred soon after I had begun practice. The midwife had no suspicion of the true condition of affairs, while the medical attendant, who was summoned on account of the outbreak of convulsions at the same time as I, and who had rapidly arrived on the spot, looked upon the latter as eclamptic in nature!

§ 686. Whether, and how rapidly, anæmia develops, will of course depend on the amount of blood lost during a certain

interval of time. But these are precisely the circumstances, namely where hæmorrhage is connected with the placental stage, under which anæmia is most frequent and severe; it also develops in a very short time, since the loss is generally copious. Occasionally complete collapse follows after a few minutes. The face turns pale, the lips white, respiration is hurried and uneasy, the pulse frequent and small, till at last the slight wave of blood is no longer able to cause pulsation in the radial artery. Moreover a sense of utter exhaustion sets in, the skin grows cool, especially that of the limbs, and is often covered by cold sweat; the sense of precordial anguish is unbearable, the woman throws herself incessantly to and fro, and calls for more air. Sooner or later these symptoms, often in a moment, end in a deep faint, and this may have an immediately beneficial influence on the hæmorrhage. If however the latter does not entirely cease, death ensues amid the symptoms of extreme prostration.

But frequently lying-in women recover, even where the general condition is apparently most unfavourable; if only the bleeding can be arrested, before too much blood has been lost to allow the necessary irritability of the nervous system to be maintained. Except in extreme cases, the absolute amount lost does not settle the issue, for one woman bears a copious hæmorrhage tolerably well, while another is seriously affected by a much smaller loss¹. Amongst favourable symptoms are distinct, vigorous contractions of the uterus, especially if such are persistent; an increased warmth of skin, the outbreak of a warm perspiration; a more regular and somewhat stronger pulse, a disappearance of the anxiety, a nascent sense of hopefulness. The result depends in large measure on the attendant; indeed there are few other conditions in which treatment can do so much. Nor is its beneficent effect a momentary one; it may extend over a prolonged period, in averting the state of prolonged marasmus, which so often follows serious hæmorrhage.

Treatment.

§ 687. It ought hardly to be necessary for me again to allude to the *prophylaxis* of hæmorrhage, after what has been said

¹ Women who are suffering from heart disease, run special risk: they can only bear a slight loss.

above. Nevertheless I must once again repeat, for an experience of many years shows me that many medical men have even now failed to clearly grasp the essential facts, and think they have done their duty satisfactorily during the placental period, when they have expressed the placenta; I therefore repeat that *the only way of preventing hemorrhage, is steadily and persistently to superrise the uterus with the hand, from the moment the child is expelled, until the uterus, after being completely emptied, has become permanently retracted.* A patient, watchful hand ensures a satisfactory state of contraction, notices any diminution at once, and prevents any unwelcome surprise on the part of the uterus.

§ 688. *Where hemorrhage is present, the object of treatment is to arrest the flow, to prevent its recurrence, and to diminish or obriate its effects.*

The various means used for checking bleeding, either act (and this applies to spontaneous arrest also) by provoking uterine contractions, or by causing thrombosis in the still open vessels. As a rule they do both simultaneously. The former class of haemostatics is of course the most important; and only where such remedies do not suffice, i.e. in the worst cases, is resort had to the latter.

The woman must first of all be placed horizontally in an accessible and convenient position, such indeed as is required for any kind of examination. The bladder must next be emptied, if at all full, since its repletion interferes with the necessary manipulations. The uterus is now sought for, and grasped with the whole hand, the ulnar side of the latter being pressed as far as possible down behind the fundus, which is to be rubbed and kneaded and forced downwards, as was recommended for assisting contractions during the management of a normal placental stage. If the placenta has been expelled, it should be examined, so as to make sure that it is entire, that no part has been left behind. If the latter accident has occurred, the practitioner should immediately and thoroughly disinfect his hand, and introduce it with a view to searching for, and removing, the remainder, which is not a difficult matter, while the uterus is still relaxed. Any clots that are lying in the vagina and cervix, are to be removed.

If the placenta has not yet been expelled, but is found loose in the vagina or cervix, it should in this case also be immediately expressed and extracted. If however it is still lying wholly or

principally in the uterine cavity, the accoucheur should only remove it, if he finds, on arrival, that much blood has already been lost, and that the loss has had a marked constitutional influence on the patient. In other cases it is best first of all to try to express the placenta. This expression, in order to be successful, needs to be done quietly, by pressure in the right places, at intervals, and for a sufficiently long time; but such manipulations will almost always effect the desired object. Indeed considering the risks which accompany the forcible removal of the placenta, and the possibility of its being torn and of some pieces of placenta or fetal membranes being left behind, and the danger of septic infection, I consider it to be an enormous advantage to escape the necessity for such a proceeding. No alarm need be felt, if somewhat copious hæmorrhage occurs during the external frictions and kneading; such a loss is merely the result of the general contraction which has been induced, and which expels the accumulated blood. It is a good sign. Nor should the accoucheur (even at the risk of being thought nervous and irresolute) allow himself to be misled by the midwife or friends, who urge the immediate removal of the placenta; an operation for removing the placenta is never a trivial undertaking. But if a certain time, in regard to which no definite rule can be laid down for all cases, has elapsed without the external manipulations proving successful, if the hæmorrhage continues or increases, or if the placenta does not descend into the vagina, in spite of the onset of contractions, its removal becomes inevitable; indeed this in itself constitutes a powerful stimulus to contraction, and the hæmorrhage frequently ceases after it.

If not, the external pressure may be continued for some time longer. A full dose of ergot should also be given, *c.g.* 1 grm. (15 grains) to be repeated once or twice at intervals of 5 minutes; or ergotin may be administered by the mouth or subcutaneously, if this preparation and the hypodermic syringe are at hand. For internal use in these cases the alcoholic solution, or its combination with *tr. cinnamomi* (*c.g.* *extractum sec. cornut. aquos.* 2 parts, *tr. cinnamomi* 40 parts, one tea-spoonful every 10 minutes till 3—6 doses have been given), is of great service; for injections, the formula: *ext. sec. cornut. aq.* 2, *aq. dist.* 10 parts is useful, 1 syringe being injected every 5 minutes (*c.f.* § 457).

§ 689. If the external stimulation and compression of the uterus do not suffice, the *bimanual* method may be tried, as was first recommended by French and English obstetricians¹, and has lately been so by Fasbender and Awater². With this object the accoucheur introduces his hand into the vagina (which is neither a difficult nor a painful operation, while the canal is in a stretched condition), and passes the tips of two or more fingers into the posterior vaginal *cul de sac*, while his other hand grasps the fundus from without, and forces it against the fingers which are lying internally against the posterior wall of the cervix, and *vice versa*. By this means not only is the uterus vigorously stimulated to contract, but a mechanical action, namely pressure, is also produced, much as is practised in cases of external superficial bleeding. Sometimes it may appear a better plan to force the anterior uterine wall directly against the posterior, but if so, the fingers must be forced high up into the anterior vaginal *cul de sac*, while the other hand grasps the posterior uterine wall from without, and presses it against the anterior pelvic wall and the fingers that are lying there.

A still more powerful way of stimulating the uterus consists in introducing into it the whole hand; this while inside the organ being clenched and pressed against the placental site. The uterine wall must meanwhile be rubbed externally and forced against the inner hand, until vigorous contractions set in, and compel the practitioner to withdraw his hand. But if the external or the abdomino-vaginal compression is properly practised, it will be rarely necessary to resort to the more serious procedure.

The use of cold may very well be combined with the measures I have mentioned; not however in the form of cold applications (these interfere with external compression, and involve too great an exposure and chilling of the enfeebled woman), nor by the introduction of ice or snow into the vagina (they will usually not be at hand, and moreover are inconvenient), but in the form of cold irrigations of the uterine cavity, and all midwives are now obliged to carry an irrigator with them instead of a syringe. If water is allowed for a moment to stream through the tube before its introduction, no air can possibly be conveyed into the genera-

¹ Cf. Hamilton, *Edinburgh Med. Journal*, 1861.

² *Berliner Beiträge zur Geburtshilfe*, i., p. 46; ii., p. 40.

tive organs. Again, if a mackintosh sheet is used, the bed cannot possibly get wet; and since the tube that is used, should remain under the sheets, while the irrigator can be filled as often as necessary, the patient will neither be exposed for any length of time, nor otherwise disturbed. The uterine tube need not be pushed beyond the internal os, and it is best to irrigate with as gentle a fall as possible, so that any thrombi that have formed, may not be washed away. It is simply the coldness of the water, which is to act as the stimulus to contraction and to coagulation. A tube with several small apertures at the bulb is better than one with a single large opening; the former scatters the water in all directions, so that there is but little danger of injecting the Fallopian tubes.

During recent years *warm irrigations of the uterine cavity* have been extensively employed instead of cold, according to the suggestion of Trousseau and Windelband (*l. c.*). As a rule they are very effective, since warmth is a powerful stimulant to the smooth muscular fibres of the uterus; while they have the further advantage of conveying warmth to the exhausted woman. The temperature of the water may vary from 44° — 50° C. (ca. 110° — 120° F.), according to the sensitiveness of the vulva and vagina.

§ 690. The remedies mentioned above will almost always be successful. But where, after repeated trial, they prove insufficient, where the irritability of the uterus is so deficient that this organ, after contracting, again and again relaxes to a marked degree, the so-called astringent remedies should at once be resorted to, with the object of directly *producing thrombosis at the placental site*. Acetic acid, alum, tannin, alcohol, tincture of iodine are all useful, but the most reliable remedy is chloride of iron, the *liquor ferri perchloridi*, which has lately been lauded in England (Barnes) with as much enthusiasm as if it had been something new. I, like others, must strongly warn the practitioner against using as concentrated a solution (1:3 of water) as Barnes suggests; it is quite sufficient (*cf.* my former *Lehrbuch*, p. 275) to add one table-spoonful of the liquor to about half a litre (one pint) of water, *i.e.* just enough to give the latter a brownish-yellow colour. A high degree of concentration would unduly corrode the inner surface of the uterus, and might thus lead to extensive and deep thrombosis of the

uterine wall, and to its sequelæ; it might also produce gangrenous endometritis and secondary infection, or cause the thrombi to be broken down, and carried away by the veins. If however the practitioner prefers, in spite of this risk, to use moderately strong perchloride of iron or tincture of iodine, care must be taken to prevent the vagina and external genitals from being corroded at the same time. A well acting surgical or uterine syringe is here preferable to the irrigator, nor should more than is absolutely necessary be injected.

§ 691. The various other measures that are recommended, are either less efficient than those given above, or else they are indicated, where the accoucheur wishes to maintain the amount of contraction that has been produced.

Plugging the vagina should be entirely rejected, since it merely converts an external into an internal hæmorrhage. It is only admissible, where the uterus is in a state of retraction, and when this organ can at the same time be fixed by external pressure. Under such circumstances however a more prolonged quasi "bi-manual" compression may be exerted by its means.

Nor do I advise *plugging of the uterine cavity* with lint or an india-rubber bag (Leroux, Diday), since this proceeding prevents retraction of the uterus. At most might such a step be advantageous, where the placental site was paralysed, or where an aneurysm of a uterine vessel had been discovered. The best way of carrying it out would be that recommended by Hyatt and Christie¹, i.e. by means of elastic bags, which are only filled with water after being introduced into the uterus; otherwise the contractions caused by their introduction might compress the bag, and expel the water.

In cases of imminent danger an attempt may be made to *compress the aorta*. The practitioner can either do this through the abdominal walls (Baudelocque, Ulsamer), or he may reach the artery through the posterior wall of the uterus, after introducing his hand into its cavity (Plouquet). The first of these methods is the best: the finger tips are brought together and pressed above the uterus, somewhere in the neighbourhood of the umbilicus, deeply into the abdominal walls, till the vertebral column and the pulsating aorta on its left side can be felt. Pressure must then be kept up on that side, so as to avoid the

¹ Cf. *Centralblatt f. Gynäkologie*, 1878, p. 332; 1879, p. 111.

vena cava. Inasmuch as this method does not reach the ovarian arteries, which arise much higher up, not much good results. The supply of blood to the uterus is not cut off, so that the latter is not rendered anæmic, while moreover the compressing fingers soon grow so exhausted, that any effect they produce will only be very temporary. Where the pressure on the aorta is really of use, it probably merely acts by stimulating the uterus, by causing a momentary increase in the blood-pressure above it, a greater repletion of the heart and vessels of the brain, and a consequent stimulation of these previously anæmic organs.

§ 692. Even when firm contraction of the uterus has been successfully induced, and the hemorrhage brought under control, fresh relaxation of the former has to be guarded against, and the existing anæmia to be combated.

In view of the first of these objects, the woman should be kept in a horizontal position, with her lower limbs raised: absolute quiet must be enjoined, fresh air let into the room, and acids and especially ergot or ergotin be freely given. But the most efficient and reliable method of all is to *keep up a permanent pressure on the uterus and permanent firm pressure on the abdomen*. For a while therefore the uterus should be compressed and watched by the hand of the medical attendant, this being subsequently replaced by firm compresses kept in place by a binder. For this purpose two or three napkins or serviettes, firmly rolled together, may be laid transversely one above the other, and pressed behind the fundus uteri, and also downwards towards the vertebral column, as if it was intended to produce strong ante flexion of the uterus. When once these napkins have been got into position, they should be held *in situ* by the hand of an assistant, while the accoucheur applies a bandage (a moderately broad towel does best), in such a way as not to interfere with the breathing; it must then be drawn as tightly as possible. A *sand bag* (only just wide enough to reach from one lumbar region to the other, and filled about $\frac{2}{3}$ ds full of moist sand, so as to lie flat when applied) is the best means of compressing the abdomen: it is an admirable adjunct to the bandage, and forces the blood from the abdominal cavity towards the upper half of the body. When firmly fixed in this way, the uterus will scarcely be able either to enlarge or to ascend, while the pressure moreover exerts a continuous stimulus to contraction.

If a clean diaper is now placed before the vulva, the nurse can at any moment satisfy herself whether, and how much, blood is still being discharged. The practitioner must never leave his patient, until the arrest of hæmorrhage is permanently assured, and this will not be for at least an hour after the bleeding has stopped, and a condition of firm uterine retraction has set in, nor until the enfeebled lying-in woman shows by the warmth and moisture of her skin that active reaction is taking place. Further, the medical attendant ought to be present, while she is being carried into a clean warm bed; this transference needs the utmost care (the woman being kept perfectly horizontal with raised hips), lest the inevitable movements provoke a recurrence of the hæmorrhage.

Nor must the desirability of maintaining the strength of the woman be forgotten, even during the attempts to arrest the hæmorrhage, as soon as the influence of the bleeding on the system becomes distinct; still more important is this matter after the cessation of the bleeding. Absolute rest is the first essential; in the next place the reaction from the state of collapse must be promoted. The extreme weakness, the thin pulse, the cool skin may seem to call for the free use of stimulants; but such a procedure would be a mistake, since they would induce a condition of violent excitement, to which the feeble patient would succumb. At most may small quantities of wine or brandy (10—15 drops in a glass of water), some warm tea, or strong meat broth be allowable; these small quantities are rapidly absorbed by the stomach, while larger ones would in its present irritable state be rejected, and thus of course only increase the collapse. The great thirst which usually exists, should not be gratified. Moreover everything should be administered warm. The supposition that warmth encourages the return of hæmorrhage, while cold prevents it, is based upon error. Cold compresses to the abdomen should therefore be left on one side¹; the proper course is here, as in the case of collapse after severe operations on the abdomen, to try to stimulate the peripheral circulation by warming the body (hot water bottles to the feet and hands and sides of the patient, bathing the head with warm vinegar or wine). The best tonic

¹ Extreme cold may actually do harm. (Cf. the case recorded by Fischer (*Schweizer Correspondenz-Blatt*, 1876, 16), in which an icebag, which had been applied for 24 hours, caused gangrene of the abdominal walls.

however is *opium*. It soothes the restlessness and irritability, increases the sense of vigour, diminishes thirst and induces sleep; by leading to hyperemia of the brain, it counter-acts the great danger arising from its anemia. But if this drug is to have these effects, it must be given in considerable doses: 20—30 drops of the tincture, administered 2—3 times at intervals of half an hour or an hour, are not too much. It may afterwards be given at correspondingly longer intervals; but as much as several grammes (1 grm. = ca. ℥ xx) may safely be taken within the first two or three days. If the stomach does not tolerate the drug, it may be administered in similar doses *per rectum* in an enema, or still better in a suppository.

§ 693. The treatment of acute and extreme *anemia*, due to copious flooding, requires great circumspection, but must at the same time be carried out without delay. The danger here arises from anemia of the brain and heart, and from the consequently weakened action of the latter. The best remedies are the volatile, quickly acting stimulants, *e.g.* the various kinds of ethers, ammonia, spirits, musk and camphor: they should either be administered *per rectum*, or else subcutaneously, for the stomach, in its still irritable condition, will as a rule not retain these substances, while speedy absorption is desirable. The most rapid and reliable restorative amongst those given above is the *hypodermic injection of sulphuric ether*; its value was pointed out by Hecker¹, and has been entirely confirmed by my experience and that of others. About 1 grm. (ca. ℥ xx) of ether may be injected 4—6 times every 10 minutes, without hesitation or fear of unpleasant local effects. What region is selected matters not, but it is a good plan to push the needle into the subcutaneous cellular tissue, and thoroughly to compress the point of puncture afterwards; the earlier the injection is given, the better.

Further, it is sometimes of benefit for a short time to force the blood which is collected in the limbs towards the trunk and so back to the heart. This may to a certain extent be done by elevating the legs, and firmly bandaging the limbs; but Esmarch's plan for producing artificial anemia is better, as

¹ Cf. Bayr, "Ueber subcut. Aetherinjectionen während und unmittelbar nach der Geburt." *Dissertation*, Munich, 1873; Hecker, *Bayr. ärztlich. Intelligenz-Blatt*, No. 22, 1873. Also Okounkoff, *Centralblatt f. Gynäkologie*, 1878, p. 161.

was suggested by P. Müller¹ (*Wiener Medicinische Presse*, 1874). There can be no doubt that by excluding all four limbs from the circulation, a large quantity of blood must be driven to the heart and brain, sufficient indeed to check the commencing collapse, and to gain time for the other restoratives to produce their effect. This proceeding however is not altogether free from danger, as is shown by a case in the Second Lying-In Institute of Vienna (Massari, *Wiener Medic. Wochenschrift*, No. 48, 1875), in which death resulted through embolism of the pulmonary arteries, caused by a thrombus which had formed in the bandaged lower limbs; it should however be added that this woman suffered from considerable varices in the limbs, and that the bandages had been left *in situ* for many hours. Where there are varicose veins therefore, this treatment should not be adopted, or only with the greatest caution. Kundrat (*cf. sub Massari*) also records a case of death through pulmonary embolism, which suddenly followed the removal of the flannel bandages, which had been applied to the lower limbs on account of varicose veins.

Lastly, *transfusion* would at first sight seem to be the most rational method of saving a woman who appears at the point of bleeding to death. The operation acts not so much by restoring the amount of blood which has been lost (150—180 grms.=ca. 5—6 oz. is the most that can be injected without risk), as by the stimulation of the heart and brain that follows the introduction of the blood. It is where hemorrhage occurs in newly confined women that transfusion has won its greatest triumphs, although it has only done so when resorted to in good time, not if delayed till the fatal issue is immediately impending; then it avails nothing. This fact however raises the question whether the woman's life would not have been preserved without any operation, more particularly as other restoratives have usually also been used. Such at least was the impression left on my mind after one "brilliant instance" in which I transfused; on another occasion the operation did no good, indeed harm, since the flooding woman had diseased lungs, as the post-mortem revealed. On the other hand, let us glance at the various difficulties connected with the execution of the operation, difficulties which remain in spite of

¹ As regards the time when this proposal was first made, *cf. Haussmann, Zeitschrift f. Geburtsh. und Gynäkologie*, i., p. 381.

all recent improvements. There is in the first place the difficulty of finding a healthy individual who is willing to give his blood, and a good assistant; all these steps moreover involve some waste of time. Then again it must be remembered that the physiological basis of transfusion is still very uncertain, and that the operation itself is a very dangerous one; lastly that it can at best only be looked upon as a means of stimulation where there is risk of bleeding to death, while we have in the use of hypodermic injections the best means of stimulation. All these considerations show that transfusion can hardly be assigned an important place in the treatment of acute anemia, and this conclusion holds good, in spite of undoubted recoveries, and of fervid panegyrics based on isolated cases.

As regards the *modus operandi*, I shall merely mention that it seems now to be a well established fact, that only human blood should be employed, and that this should be defibrinated, unless indeed the transfusion is made directly from arm to arm, as is best done by Aveling's method (*Obstet. Journal of Great Britain*, i., 1873, p. 289), or with the apparatus of Roussel of Geneva (*Medical Times*, 1876, ii.).

§ 694. If the woman has escaped the immediate dangers of hemorrhage, and has survived the first day, every effort must be made to restore her strength by good nourishment, while of course the uterus is also closely watched. Fluid, easily digestible nourishment should be frequently given, but always in small quantities: for instance meat broths, meat tea, milk alone or with Russian tea¹, eggs, white bread. The anæmic headache and other brain symptoms are best combated by warmth to the head, and by opium or morphia. If the child is alive and the condition of the mother satisfactory, the practitioner should urge her to suckle the infant diligently, at any rate for the first week, in view of the beneficial effect that nursing has on uterine retraction and involution. Ergot is also eminently desirable during the first week, and should now be given as an infusion made with boiling water; 5 grms. in 120 (5iss. in ca. 3℥.iv) of water with 1 grm. (ca. mxxvi) of dilute sulphuric acid may be administered four times a day, in doses of one table-spoonful; sometimes a little laudanum is a useful addition.

¹ The Russians drink their tea without milk or sugar, but frequently with a squeeze of lemon in it (cf. Pavy, *A Treatise on Food and Dietetics*, 2nd ed., p. 352). (Tr.)

Atony of the Placental Site.

§ 695. In very exceptional cases the atony is not generally distributed over the uterus, but limited to the placental site. Or else that site is devoid of all contraction, while the remaining portion of the uterine walls is irritable, although not to the normal degree—*atony of the placental site*. Rokitansky¹, who first pointed out how extremely dangerous to life this condition was, states that the placental site is forced inwards towards the uterine cavity by the musculature which contracts all round it, the result being that the area of insertion bulges inwards in the form of a prominent swelling, while over the corresponding area externally, the uterine wall is felt to be slightly indented. This condition leads to persistent and exhausting hæmorrhage, which may last for several weeks, and in this way prove fatal. The depressed area, bulging like a tumour into the uterine cavity, is spongy, bleeds, and of course presents the characteristics of the placental site. A portion of the placenta is often still adherent to it, or else clots that have become attached to the wall, may be so. In the only instance of this kind which I have seen, a portion of the placenta was still adherent, its removal being effected on the third day.

The above description will show that this condition corresponds to the first stage, i.e. the beginning, of *inversion of the uterus*. Indeed Rokitansky showed that it might be produced by (amongst other causes) the traction that is associated with the artificial removal of the placenta, as so often happens with inversion. The portions of the placenta which have been left behind, appear to play an important rôle, and no doubt explain the great frequency with which this condition follows on abortion, after which of course such retention is not rare. If the placental site has been dragged down into the cavity, and has once caused inversion of that area, the contraction of the surrounding regions will maintain, or even increase, the latter, and thus prevent retraction. If on the other hand there are adherent portions of the placenta which interfere with the contraction of the "site", or if that site is atonic from the very start (and some observations prove that this may occur), having possibly been deeply involved during

¹ Cf. *Patholog. Anatomic*, ii., 1842, p. 555. (The Sydenham Society's Translation, 1849, Vol. ii., p. 304) ; 2nd ed., iii., p. 501.

the formation of the placenta (*cf.* fig. 71, § 345), then when the other portions of the uterine parietes contract, the area in question cannot assume the externally convex form which it should, and which it in other cases strives to attain during a contraction. Consequently that area sinks in, and will be constricted by the surrounding portions (*cf.* the chapter on "Inversion", § 712).

§ 696. The *diagnosis* will probably be easy, for careful palpation will reveal the external depression, and a digital examination will detect the shape of the uterine cavity. The object of *treatment* must in the first place be to remove all hindrance to the contraction of the atonic area, *i.e.* to remove any remnants of placenta or adherent clots. Indeed this reason alone makes a thorough exploration of the uterine cavity necessary. If the cervix is not sufficiently wide to allow of such examination, it must be dilated with laminaria or sponge tents, the introduction of the latter being in itself a powerful stimulus to contraction. As soon as the practitioner has got rid of the obstruction, or assured himself of its absence, a state of contraction must be induced as rapidly as possible by the various means recommended above (ergotin, external and bimanual pressure). In the worst cases the hæmorrhage must be stanchcd by styptic injections, as for instance by a somewhat strong solution of liquor ferri perchloridi. As I have already remarked in § 690, it may occasionally be desirable under such circumstances to plug the uterine cavity; but the better plan would be to use the hand for introducing a sponge, or a tampon of cotton wool¹, soaked with a solution of chloride of iron into the uterus, and to press it directly upon the placental site.

(2) Stricture of the Uterus.

§ 697. Where a stricture of the uterus exists, the organ is not found in an entirely flaccid, but in a more or less contracted condition, and of irregular form. The stricture is almost always situated at the isthmus, *i.e.* at the situation of the obstetrical internal os. Rarely does it lie higher; the supposition that it frequently does so arises from ignorance as to the position of that internal os immediately after the expulsion of the child. The uterus in these cases generally lies very high, often appears elongated, and has the shape of a bottle or hour-glass; indeed the

¹ Wynn Williams' "Ready Method", *cf.* *Obstetrical Transactions*, xl., p. 235.

condition is called "hour-glass contraction" in England. Below the constricted point lies the wide lower uterine segment, above it the usually likewise relaxed uterine body. The former is not uncommonly more roomy than the latter, so that the accoucheur is tempted, after having introduced his hand, to suppose that it has penetrated into the cavity of the uterus, while in reality it is still lying in the wide cervix or lower segment of the uterus, and to regard the strictured region as a zone of the contracted uterus. That region can usually be felt through the abdominal walls.

The placenta is usually left behind : indeed its retention is as frequently the cause of the stricture as is the converse relation. It may either lie entirely above the stricture, or else one lobe be detached, and projects through the latter (*incarceration of the placenta*, which may be complete or incomplete). Hemorrhage is rarely absent, since the placenta is not wholly detached, and the site of insertion is therefore unable to contract uniformly, and since, even when detached, the placenta prevents a sufficiently vigorous retraction. Apart however from the influence of the retained placenta, the contraction of the body of the uterus in cases of stricture is rarely as uniform, as it must be for arresting hemorrhage. Still the bleeding is as a rule not so copious as in the purely atonic condition : when it is, such condition probably affects the placental site at the very least. Under such circumstances the hemorrhage may continue, even after the stricture has been got rid of and the placenta removed.

The causes of stricture have been stated in § 468. But I must add here that this, even more frequently than the atonic, condition, is artificial, due to mismanagement of the placental period, and still more to positively injurious practices, such for instance as pulling on the umbilical cord, useless palpation and dilatation of the cervix simply because the placenta is momentarily retained, a view which many years ago Douglas (*Medical Transactions* published by the Royal College of Physicians of London, vi., 1820) tried to establish, and which is now demonstrated by the statistics of lying-in hospitals. Unavoidable strictures are only occasionally met with in the rare cases of retention, which are due to a pathological adhesion of the placenta, or to metritis which has developed previous to, or during, labour.

§ 698. *A stricture can very quickly be detected.* The external form of the uterus is in itself a sufficient guide, while in addition the examining hand will, when passed through the flaccid cervix, easily feel the constricted portion.

The first object of *treatment* must always be, both when the placenta is retained and when it is not, to get rid of the stricture, to induce a uniform state of contraction, and by this means, as well as by expression, to bring about expulsion of the placenta. Only in the rare cases of profuse hæmorrhage, might it be wise to abandon this principle and immediately to evacuate the uterus. With a view to getting rid of the state of spasm, warm fomentations may be applied to the abdomen, and friction to the hypogastrium; warm enemata of chamomile tea, with the addition of oil of turpentine (one table-spoonful), of laudanum (20 drops of the tincture) or of chloral (3—4 grm.=grs. xlv—lx), are also useful; or subcutaneous injections of morphia; or these combined with atropine (*cf.* § 468). The latter however should be kept as the last resource. Chloroform in my experience has curiously enough not had any, or only a slight, influence on strictures accompanying this stage of delivery; and I therefore, out of consideration of the bleeding, entirely abstain from its use, except where it is required for the forcible removal of the placenta, just as it might be for any other operation. Such removal however must, as already mentioned, only be undertaken, where urgent necessity exists, for it is associated with special risk in these cases of stricture, which so frequently depend on uterine irritation. But on the other hand it must not be postponed till too late, *i.e.* until inflammation is in full swing. The *modus operandi* will be given below (§ 703).

The treatment to be pursued after removal of the placenta, and when the stricture has been got rid of, is the same as that recommended for hæmorrhage due to atony.

(3) *Retention of the Placenta.*

§ 699. *Retention of the placenta* (sometimes, but not necessarily, accompanied by slight or copious secondary hæmorrhage) may occur, when the uterus is doing its best to contract. This condition may be due (a) to undue bulkiness of the

placenta, or to a deviation of the axis of the uterus from that of the pelvic brim; (b) to morbid adherence of the placenta, or (c) to adherence of the chorion.

(a) The presence of an *abnormally large placenta* may be suspected (cf. § 361; the enlargement may also be due to coalescence of the placenta in cases of multiple pregnancy), when, although the uterus is contracting well and regularly, and there is an absence of both pain and hemorrhage, the placenta is nevertheless not driven down, and the parturient woman merely feels its pressure above the pubes. Under such circumstances vigorous expression may be practised, assisted, if need be, by traction on the cord in the way that will be described below. If this method does not prove successful, or if there is reason to fear that, in spite of the greatest care, the cord will be torn, it is best without much delay to remove the placenta, by using the whole hand for the purpose.

A condition in which *the axis of the uterus deviates considerably* from that of the pelvic brim, is not very uncommon; the flexion is most often forwards, and is easily produced by external pressure which is not well directed. The physical signs, excepting those associated with the displacement, are exactly the same as have been mentioned under retention of an enlarged placenta, and if the uterus is brought into proper position, and expression applied in a suitable direction, the wished for result will be attained. Where the placenta is hooked "over the pubes", the expression must be exerted forcibly backwards towards the point of the sacrum; a pull from below in the same direction will give material assistance.

§ 700. (b) It is extremely rare for the *placenta to be abnormally adherent to the uterus*, although such a condition is still so frequently diagnosed in medical practice. The error arises from the fact that the attendant often mistakes the true cause of the retention; he does nothing to promote spontaneous expulsion, and lacks patience. He is in a hurry to extract the placenta from the uterus, frequently tears the placental tissue, gets confused in regard to it, and brings away the placenta piecemeal—saying that it was "adherent". Curiously enough the most experienced and skilful accoucheurs and midwives see fewest cases of "adhesion", while in lying-in hospitals such belong to the rarest phenomena! Lastly, in cases of Cæsarian

section &c. adhesion of the placenta is scarcely, if ever, mentioned.

Actual adhesion, where present, is either due to the changes described in the chapters on "Anomalies of the Decidua and Placenta" (Vol. i., pp. 447, 465), especially to the hypertrophy of the connective tissue of the placenta (§ 364), or, and this is probably the commonest cause, to imperfect development of the superficial portion of the glandular layer of the decidua (*cf.* § 89), the portion which was called "areolar" by Langhans. If the glandular ampullæ which lie there, are imperfectly developed, or if the septa which lie between them, instead of being composed of highly cellular, soft tissue, consist of firm tissue with abundant intercellular substance, then the loose condition of the tissues which is necessary for the detachment of the placenta, does not exist, the result being that the placenta is abnormally firmly adherent. The thick "tendinous" bands, which have to be pinched through in detaching the placenta, and of which one hears so often, are merely the stems of the chorionic villi running straight from the chorion to the serotina. The line along which the placenta is detached, then passes through fetal tissue, since the maternal decidua is too firm and probably also too thin, to be readily peeled off with the finger. At other times these bands are formed out of the (in consequence of placentitis) sclerosed intercotyledonary prolongations of the decidua, and the line of separation then passes through maternal tissues. In either case the serotina usually remains wholly, or almost wholly, attached to the uterus, and where the adhesion is due to hypertrophy of the connective tissue of the placenta, the whole of the diseased lobes of the latter may occasionally do so (*cf.* § 364).

This adherence, whatever the immediate physical cause, is primarily due to endometritis, and generally to such of an earlier date¹. Endometritis can account for the hyperplasia within the placenta as well as for the imperfect development of the areolar, ampullary layer, for these may both result from a previous destruction of the glands, and their partial replacement by connective tissue. Further, the adhesion is almost always only partial; extremely rarely is it complete, indeed I have never found it so in my practice. But this fact of course does not

¹ *Cf. inter alios Muter, Berliner Beiträge z. Geburtsh.,* ii., 1878, p. 160.

disprove the causal influence of endometritis, since the sequelæ of the latter need not affect the serotina with uniform intensity.

§ 701. If the placenta is partly detached and partly adherent, hæmorrhage occurs (as in placenta prævia) from the uterine sinuses which open at the detached portion, not from the placental blood spaces, which are there exposed, and into which Sir James Simpson believed that blood could continue to be conducted through the portion of the placenta which was still connected with the uterus; these lacunæ of the placenta become thrombosed immediately after the detachment. The bleeding may either be continuous or intermittent, and is due to the fact that the adherent portions prevent an adequate and equable retraction of the placental site. The amount of hæmorrhage varies with the degree of contraction, but is sometimes very considerable. Moreover a stricture occasionally develops at the same time, in consequence of the irritation which is caused by the adhesion and by the secondary mechanical hindrance to retraction. As a rule however such stricture, where present, has been produced by the attendant.

The signs, which point to abnormal adhesion, are the following: in spite of the efforts of the uterus to expel its contents, the placenta does not descend, nor does the size of the uterus diminish; during the contractions much blood is discharged; when the cord is pulled, the whole uterus yields instead of its contents alone doing so, the confined woman meanwhile experiencing a localised, fixed pain. All these indications however are as little reliable as are the accounts that women so often give of the symptoms, that accompanied adhesion at their previous confinements, or indeed of the fixed uterine pains during pregnancy. I have again and again been present at confinements where such statements were made, without finding any adhesions; the probability is that no such adhesions existed at the previous labour, although the placenta was forcibly removed. The only way to make the diagnosis certain, is to introduce one hand into the uterus, a step which may be required for the purpose of detaching the placenta, if bleeding persists, and the placenta is not expelled within a certain period, after the ordinary means have been tried. It is however always a delicate operation, which exposes the lying-in woman to great danger, owing to the concomitant risk

of septic infection, of injury to the uterine parietes, and of the retention of bits of placenta.

§ 702. (c) Retention, caused by *abnormal adherence of the chorion to the uterine wall*, can only occur, when at the same time that foetal membrane is tough and very resisting along the edge of the placenta; otherwise the placenta tears off, leaving the chorion behind. The adhesion is usually in the lower portion of the body of the uterus, and if so, the placenta lies in the vagina and partly also in the cervix uteri; but if the adhesion is situated higher, the placenta may be entirely prevented from descending into the vagina. The adhesion is usually due to the inner layer of the glandular stratum of the decidua not being as loose, as physiologically it ought to be, *i.e.* to much the same condition as that which is so often the cause of abnormal adhesion of the placenta (endometritis of pregnancy); or else it is due to defective involution of the cellular layer of the decidua, which is then found attached in large, thick remnants to the separated chorion; or it may doubtless depend on secondary agglutination caused by consolidated masses of fibrin, remains of previous extravasations of blood into the decidua; and lastly perhaps on a localised condition of undue hyperplasia of the villi of the smooth chorion, a sort of placenta spuria (§ 359), this giving rise to tendinous fibres, which are firmly connected with the decidua¹. The detachment of the chorion from the placenta may also possibly arise from the membranes being incarcerated as a result of a stricture at the internal os, although that condition will hardly lead to retention of the placenta.

The abnormal chorionic adhesion is usually confined to a localised area, but in rare cases is very diffuse, and extends almost all round, forming a ring-shaped band. When the latter condition is present, the first part to descend into the vaginal fornix, may be the foetal side of the placenta and the amnion which has been in part stripped off, while the inverted chorion forms a flaccid sac filled with blood, projecting from the cervix, and whose lowest portion consists of the placenta; I have seen this condition on two occasions, the body of the uterus being well contracted at the time.

I may take this opportunity of mentioning that sometimes, while the placenta is still retained in the uterine cavity, such a sac is found filled with blood, and

¹ Cf. Ch. Hüter, *Crede in Klinische Vorträge über Geburtshilfe*, 1854, p. 256.

formed by the membranes which project bladderlike from the os uteri. Spöndli (Seanzoni, *Beiträge*, ii., p. 16) and Fürstnatt (*Die Operative Geburtshilfe an der Entbindungs-Anstalt zu Graz*, 1860, p. 136) state that such a sac may simulate the bag of membranes of a second twin.

The variety of placental retention which has just been described, can of course only be recognised, when the hand has been introduced into the parturient canal. The adhesions should be immediately broken down, and the after-birth removed.

The condition in which the chorion alone is retained, or the decidua, or separate portions of the placenta or a placenta succenturiata will be described under "Pathology of the Puerperal State" (§ 802).

(4) *The Removal of the Placenta from the Uterus, and its Artificial Detachment.*

§ 708. The period of time at which the placenta should be artificially removed, must necessarily depend upon the urgency of the symptoms, which are produced or kept up by the retention of the organ, and upon the ascertained futility of the external manipulations. Probably no one nowadays would recommend that the placenta be left in the uterine cavity for any considerable length of time after a full term labour, although instances are on record in which it has remained *in utero* for some days unaltered, and has then been expelled¹. For the relations after a full time labour are emphatically different than those after abortion, where we know that a very long interval frequently elapses between the expulsion of the fœtus and that of the placenta (§ 409 *b*). By the end of pregnancy the physiological loosening of the serotinal tissues, either of the whole or at any rate of its largest part, has advanced so far, that the arrest of the fœtal circulation through the placenta would almost inevitably lead to putrefaction of the retained mass, more especially as the attempts to remove the placenta are almost sure to be accompanied by the admission of air into the uterine cavity. The complete adherence of the placenta, *i.e.* the condition in which the uninjurious retention after abortion with a long interval of rest is principally observed, is extremely rare after labour at the full time; moreover the risk of secondary hæmorrhage after the

¹ Cf. Hegar, *l. c.*, pp. 81—85. Novi, *Centralblatt für Gynäkologie*, 1878, p. 240.

latter is far greater ; while in addition owing to the very different development and size of the blood- and lymph-vessels, septic and thrombotic disorders are much more probable. The same remarks of course also apply to the retention of separate portions of the placenta, perhaps in a still higher degree ; indeed it is never safe to rely on the innocuous discharge of the products of decomposition. Since moreover the artificial removal becomes more and more difficult and injurious, as the retraction of the uterus and the involution of the cervix progress, such removal should be done early, as already recommended.

§ 704. Unless there is good reason for definitely assuming the contrary, the retained placenta should always *a priori* be looked upon as a detached mass lying *in utero*, or at any rate as not abnormally firmly connected with it, and an attempt made to remove it *by traction*, so as to escape the necessity of undertaking any unnecessary intra-uterine manipulations. The uterus must in the first place and *per abdomen* be brought into the median line and into the axis of the brim, and then should be given in charge to an assistant, while the accoucheur, standing or sitting at one side of his patient, introduces his index finger into the vagina, and flexes it somewhere about the middle of the pelvic cavity in such a way that it lies nearly transversely against the umbilical cord ; if the end of the latter is now drawn down over the intra-vaginal finger with the help of the other hand, the traction will be exerted *perpendicularly* to the uterine orifice, *i.e.* in the direction in which it will meet with the minimum resistance. This is a much easier way of effecting the end in view, than to place the tips of the index and middle fingers on the cord at the external os ; for the fingers are then apt to slip off, while the line of traction runs too far backwards. External pressure, exerted by an assistant at the same time as the internal traction is applied, is of course of great help. If the after-birth has descended into the vagina, the course of procedure described in § 197 should be followed.

If the practitioner fails to extract the placenta in this way, he should introduce his hand into the uterus ; which one is selected matters not. The umbilical cord being now kept on the stretch with the free hand, so as to serve as a guide, the operating hand (brought into the form of a cone and with its dorsum towards the sacrum) is introduced with a rotatory movement through the vagina

and cervix. During its passage through the latter, the uterus must be fixed from without, and pushed towards the fingers, so as to prevent the vaginal fornix from being lacerated or perhaps even torn off, and the uterus from being unduly displaced. If the placenta is found wholly or in great part detached, another attempt may be made to remove it by *pulling on the cord*. But the fingers must be so placed across its placental end that the pull on the cord is exerted over them as over a pulley, and acts *perpendicularly* to the placenta. Appropriate external pressure must be simultaneously exerted by the assistant, whenever he is so directed.

§ 705. If the removal cannot be effected in this way, or if the umbilical cord has torn off, the detached portion of placenta should be sought for (while the free hand keeps a firm grasp on the body of the uterus from without), and the adducted fingers pushed in between it and the uterine wall; the free portion is then seized, and an attempt made with its help to detach the whole mass from its site, not actually by pulling, but by *rolling* it off. The more this can be done, the higher up are the fingers to be pushed, *until at last the whole mass is, so to speak, rooted in by the hand*. Where however the adhesions are too firm to yield so easily, the four straightened and adducted fingers must be slipped in between the detached portion and the uterine wall, and the separation completed by a sort of *sawing movement*. During this manœuvre, the back of the hand must be kept as much as possible turned towards the uterine wall, the tips of the fingers kept away from the latter and directed towards the placenta, so as to avoid any serious injury to the innermost muscular layer of the uterus (which is so important for arresting hæmorrhage and restoring the mucous membrane), and to the layer of decidua that is still adherent. At this stage contractions of the uterus are of great value, since they make it much easier for the operator to feel how far he may safely proceed with the peeling, without injuring the uterine wall, and since the separation can be more easily effected when the subjacent surface is hard. Hence contractions should from time to time be induced by a vigorous use of the external hand. Care however must be taken not to plough up the placenta unduly, since there is risk of extensively tearing it, of losing the help which tactile sensations afford as to the position of the fingers, and of leaving

remnants behind. Hildebrandt¹ effects the separation within the fetal membranes, these being made to form a glovelike covering for the operating hand. This plan, he says, has the advantage of avoiding serious damage to the internal surface of the uterus as well as septic infection, without adding to the difficulty of the operation. Speaking generally, I can confirm the latter fact after an experience of several cases, but it is not often that I have occasion to detach a placenta; my experience however is that the membranes can only be used successfully, where the placenta which is to be detached, is only loosely connected, and that the assistance derived from tactile sensations is greatly diminished by this method.

As soon as the separation has been completed, the after-birth usually glides down along the hand. But it is always best to get it well into the hollow of the hand, to (as already mentioned) cover it in, and with the help of simultaneous external pressure to force it with the flat surface of the hand through the cervix into the vagina. This is a safe way of avoiding the possibility of some cotyledons being torn off or left behind, an accident which is more particularly liable to occur, when the mass is simply drawn out, inasmuch as the detachment is apt to be accompanied by considerable laceration. When the placenta is lying in the vagina, it should be rolled together, beginning at one edge, before being extracted, so that the fetal membranes may wind round it, and be withdrawn at the same time.

§ 706. Where the placenta is *abnormally adherent*, it should be peeled off in like manner by the (adducted) fingers, commencing with the free portion. This may prove a very difficult matter, and the greatest care and gentleness are necessary to avoid injuring the uterine walls; in this case also contractions of the uterus are very useful, as serving clearly to indicate the boundary between placental tissue and uterus. If some portions are found very firmly adherent, it is best not to use much force in separating them; the better plan is either to leave them *in situ*, or to carry the line of separation through the placental tissues, so that the layer which lies nearest to the uterine wall, remains attached to this. The firm thick bands, which sometimes

¹ Cf. Kühne, "Die künstliche Lösung der Placenta innerhalb der Eihaut". Königsberger Dissertation, Leipzig, 1873.

resist the detachment (*cf.* § 700), may be pinched through with the tips of the fingers; where this cannot be done, as much tissue as possible should be carefully stripped off, and the remnants left attached to the uterus.

Where the placenta is not detached along any accessible portion of its edge, the detachment should be begun at the thickest portion. If however the edge is very thin and not in sharp contrast to the decidua vera, as sometimes happens (especially where the formation of placenta has been very extensive), it may be necessary to commence to detach at the middle, by boring one or two fingers in at that point, and from there carrying on the detachment in a peripheral direction. Under such circumstances the more vascular the placenta is, the better; indeed some one has suggested, and it is a reasonable suggestion, that the organ be distended by injecting water through the umbilical vein (Mojon, Hohl).

Where the placenta is attached to the *anterior* uterine wall, it should be detached in the lateral posture, the practitioner standing at the back of the woman; here again the back of the hand must be directed towards the uterine surface.

§ 707. A *stricture* at the isthmus of the uterus is one of the most troublesome complications in this operation, and I therefore recommended in § 698, that, where possible, it should first of all be got rid of, or at any rate diminished. If this cannot be done, or if hæmorrhage forbids delay, the accoucheur must force his hand through the constricted region. First one, then a second, finger is pushed in, and slowly followed by the others in succession; in this way with patience and perseverance, success will probably always be attained, although the condition may be a most "tantalising" one, compelling the operator to withdraw his exhausted, almost paralysed, hand and to substitute the other. Since moreover this proceeding causes a good deal of pain, it may be well to give the lying-in woman some chloroform, provided that her general condition and the absence of hæmorrhage allow of it. When at last the placenta is reached, it should in these cases also be pressed out with the whole hand from above; otherwise one part might be pulled out, while the remainder is detained through a recurrence of the stricture.

If the case is so difficult, that the constriction cannot be over-

come without resorting to violence, it is better to give up the attempt, so as not to aggravate a condition which is already serious. Sooner or later the stricture is sure to relax, when a fresh attempt to remove the placenta will prove successful.

§ 708. Lastly, I must mention that, after every operation for the removal of the placenta, the practitioner should forthwith carefully examine the latter together with the membranes, so as to ascertain that nothing has been left behind; if any portion is absent, it must be immediately searched for. Even where nothing appears to remain in the uterus except large clots, these should be removed. The uterine cavity and the vagina should next be irrigated with a tepid carbolic lotion (2 p. c.), unless the presence of hæmorrhage indicates the need for styptics. The accoucheur should for some time longer continue to watch the uterus *ab externo*; he may then apply the binder, and give a full dose of ergot. The further treatment must depend on the conditions accompanying, and following upon, the operation.

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3. Inversion of the Uterus.

§ 709. By inversion of the uterus is meant a condition in which the body is inverted into the cavity. The result is that the aspect of the walls is reversed; the internal becomes the external, the original cavity disappears, while a fresh one is formed, which opens upwards and is lined by serous membrane. This fresh cavity contains a portion of the Fallopian tubes and of the broad and round ligaments which have been dragged in, and in recent cases sometimes also the ovaries, and not rarely a loop of intestine.

The extent of inversion varies. In the first degree there is merely a depression at the fundus, a cup-shaped indentation, which projects for some distance into the uterine cavity (fig. 112).

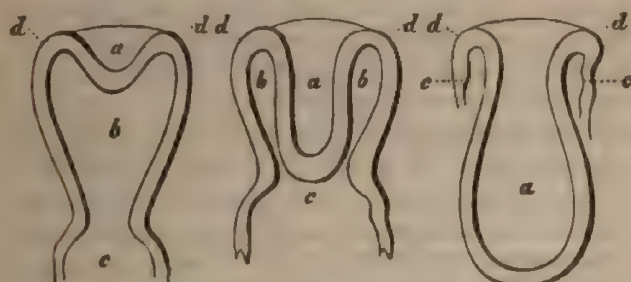


Fig. 112.

Fig. 113.

Fig. 114.

Diagrams showing the various degrees of inversion.

- a. Inverted fundus.
- b. Uterine cavity.
- c. Vagina.
- d. Upper edge of the depression formed by the inversion.

This is the condition that is met with in the cases of atony of the placental site described above (§ 695). In the second degree the fundus has descended to the internal os, or more or less beyond it (fig. 113), and resembles a polypoid growth; here the body of the uterus is alone inverted. Lastly, in the third degree the whole of the body with a portion of the cervix is inverted; indeed the cervix may be affected right down to the line of its vaginal attachment (fig. 114). In such cases the inversion is complete, and the condition is sometimes described as *inversion with prolapse*. The uterus lies in the vagina and vulva, or even outside the latter, forming a round tumour, which grows narrower

higher up, and possesses a villous, bleeding surface; the vaginal canal itself is shortened, and ends above in a ring-shaped fold, formed by the lips of the portio vaginalis, which corresponds to the point of reflexion of the uterus.

Causes.

§ 710. Inversion is one of the most serious accidents, which can befall a lying-in woman. Happily it is very rare; only one case has occurred out of 190,000 deliveries which have taken place in the famous Dublin Rotunda, since its foundation in the year 1745; and the results of other maternities are similar¹. We are justified in inferring from this that the accident may almost always be prevented, if a labour is carefully conducted; while conversely it will occur where labour takes place without any assistance, or when such is afforded by an ignorant person, and this is proved by the bibliography of the subject.

The inversion may occur immediately after the expulsion of the child, or only after that of the placenta. The former is more frequent, and the inversion is then usually a nearly complete one from the very first. If on the other hand the accident occurs simultaneously with, or after, the discharge of the placenta, then (although it may here also be complete) as a rule it begins as a mere indentation, out of which the inversion develops either rapidly, or slowly. The statements that it may not arise until several days after delivery, are probably based upon error; in other words the primary stage has occurred during delivery, but has been overlooked.

The indispensable requirements for the production of inversion are a flaccid state of the uterine wall, a wide cavity, and either pressure from above, or traction from below. These conditions are never so well developed as immediately after delivery, especially so, the more nearly the latter occurs to the full term of pregnancy. I have however, when describing *abortion*, stated that it too may be followed by inversion², nor will this cause surprise, if it is borne in mind that even a non-gravid uterus which is affected by some new growth, may be inverted.

¹ I have only met with one case in the hospital which is under my care; cf. *Kronecker, Archiv für Gynäkologie*, xvi., p. 242.

² A number of such cases are recorded by Scott, in the *American Journal of Obstetrics*, xiii., p. 56. Cf. also Woodson in the *American Journal of Medical Science*, Oct., 1860, p. 410.

Relaxation of the uterine wall is the principal requirement; it may either be general, or limited to a portion of the body, and then always to its fundus. No inversion is possible, when the upper segment of the uterus is contracted, since even apart from the resistance of the contracted muscle (which is an obstacle to any indentation), the contracted wall becomes more convex and rounded externally than it was before. It follows therefore that the views of Radford and Tyler Smith and also that of Taylor¹, according to which the inversion first affects the relaxed cervix (this being rolled outwards), after which the body is forced through it by the agency of its contraction, are utterly false.

§ 711. The inverted portion is therefore always in a passive state. Now let us suppose the whole uterus to remain flaccid during, and after, the expulsion of the child; let us suppose especially that the latter takes place so rapidly that the uterine wall is unable to retract sufficiently during the same period to adapt itself to the altered relations of its contents; then, if pressure happens to be exerted from above (such as it may be by the abdominal pressure, or by a hand), or if the body of the uterus is pulled down by means of the umbilical cord while the placenta is still adherent, the whole organ, except the cervix (when this is contracted) or including it (when it too is relaxed), may be turned inside out (*passive*, spontaneous, or artificial inversion, according to Matthews Duncan). Neither the broad nor the round ligaments, prevent this, for they are sufficiently relaxed and elongated to be able to follow the fundus downwards. The spontaneous pressure, which is exerted by the abdominal muscles, is here of more importance than that of an assistant's hand or than traction on the cord. Hence also inversion is comparatively common in labours that have neither supervision nor assistance, especially precipitate labours, or such as take place in the erect or squatting posture, particularly if the cord happens at the same time to be short and tight. The reason why inversion is not even commoner under such circumstances, probably depends on the fact that the abdominal pressure usually acts as a stimulus to contraction of the uterus, and that where the cavity of the latter is suddenly emptied without sufficient contraction, it usually fills with blood, as a result of which the positive intra-uterine pressure is approximately re-established. The best illustration of the action of

such intra-abdominal pressure on the relaxed uterus, is seen in the cases in which the uterus has been inverted after death, simultaneously with, or immediately after, the expulsion of the child¹.

There are several instances on record, in which the inversion was produced by manual pressure. Thus Johnston (Sinclair and Johnston, *Practical Midwifery*, 1858, p. 450), Schnorr (*Monatsschrift f. Geburtshülfe*, xxx., p. 1), Kulp (*Berliner Beiträge*, i., 1872, p. 78, Sitzungsbericht) and Stadfeldt (*Centralblatt f. Gynäkologie*, 1878, p. 463) relate cases in which the efforts made to express the placenta were more particularly the active agent. Of course inversion can only occur as a result of pressure made for the purpose of effecting expression, when this is wrongly applied, e.g. with a relaxed uterus, and during an intermission, instead of during a pain.

Inversion however is not infrequently due to an external factor, viz. traction on the umbilical cord or placenta; the recorded cases prove this. But this cause is not so common as used to be believed, when the true mechanism of the production of inversion was less clearly understood.

§ 712. In a great many cases, probably in all those in which the inversion is not produced until after the complete evacuation of the uterus (but not uncommonly also where it precedes the discharge of the placenta), the condition at first amounts not to complete inversion, but merely to an indentation of the fundus. The latter is alone in a passive condition. The explanation must lie in some special muscular weakness or imperfect development of this region, or in the musculature having been involved during the formation of the placenta, or being in a state of atony—a condition which has to some extent been discussed in § 695. Now although, under normal circumstances, the placenta is rarely inserted exactly into the fundus of the uterus, yet on the other hand it is quite the exception for a case of inversion to be met with¹ in which the inversion began in the neighbourhood of a Fallopian tube, or at the anterior or posterior wall of the uterus. So that there would seem a possibility that the attachment of the placenta to the fundus might be an important cause of inversion, a view which Crosse was the first

¹ Cf. Bedford-Taylor, *Guy's Hospital Reports*, x., 1864. Reimann, *Archiv f. Gyn.*, xl., p. 215; Börner, *Loder's Journal für Chirurgie &c.*, i., 1793.

to adopt¹. And as a matter of fact the attachment in question (i.e. to the fundus) was found in 23 cases collected by Hennig, in which the exact insertion of the placenta into the inverted uterus could be determined. Of course it is rare, but then inversion is also rare².

When once the passive, relaxed, fundal portion of the uterus has been indented, either spontaneously by the intra-abdominal pressure, or by the dragging of the adherent placenta, or artificially by the pressure of the hand or by traction of the cord, it projects into the uterine cavity like a foreign body or a polypus. The same influences may then rapidly convert the indentation into an inversion, supposing them to act at the moment at which the remaining, previously well contracted, portion of the wall of the uterine body again relaxes; but as a rule the inversion is completed by the action of the uterus itself (*active inversion*, according to Matthews Duncan). The non-inverted, contractile portion of the wall regards the depressed portion as a foreign body, contracts, grasps it, and forces it further and further down and out of the os, much as happens in cases of intussusception.

Symptoms.

§ 713. The two principal symptoms of a sudden and complete inversion are *shock* and *hæmorrhage*. The former reveals itself by an alteration in the features of the woman, by an expression of anxiety, by shivering and vomiting, by the smallness of her pulse and coolness of her extremities; it may rapidly prove fatal. This collapse cannot be altogether ascribed to the bleeding, since it is occasionally present, where the latter is but slight; it is caused by the sudden shock to the uterus, and is doubtless assisted in its development by the sudden fall of the intra-abdominal pressure, consequent upon the expulsion of the uterus, and by the concomitant rapid and great distention of the large abdominal veins. Indeed the women sometimes of their own accord mention a sense of emptiness in the abdomen, and a forcing downwards of its contents. The *hæmorrhage* is a result of the deficient contraction of the uterus. Hence its severity and duration mainly depend on the character of the latter. If

¹ Oldham; Lever. *Guy's Hospital Reports*, 1855, i.; Crossue (*cf. Literature*).

² In the case which occurred under my care, the placenta was not inserted into the fundus (*cf. Kroner, l. c.*).

the wall is relaxed, the loss of blood may be excessive : but if the uterus contracts after the inversion, the bleeding may be inconsiderable, or even absent. Moreover the non-inverted portion, i.e. the isthmus and the cervix, may constrict the inverted portion to such an extent that the hæmorrhage is mechanically checked. The condition of the placenta is also important ; where this is still partially adherent, hæmorrhage is never absent, although it is often so with complete adherence or detachment.

Where there is merely an indentation, or where the inversion develops by degrees, there are usually no symptoms of shock ; it is the hæmorrhage which calls for immediate treatment, and next to it come the *mechanical effects of the displacement*. The latter may also show themselves, where the inversion has all at once become complete, as soon as the severe primary symptoms have passed away, and provided no re-inversion has occurred. The tumour in the vagina at first causes irritation of the bladder and rectum, both by its size and by the dragging on its attachments, and leads to severe tenesmus. Then follows inflammation of the uterine body, which is constricted by the cervix and exposed to various injuries in the vagina. This inflammation may lead to deep-seated mischief and gangrenous destruction, rapidly ending fatally through septicæmia or septic peritonitis. Indeed the necrosed uterus may be thrown¹ or torn off (Cooke), and even then recovery is possible. The intestine also, which is lying in the inverted portion, has been found to be strangulated². But as a rule the inflammation continues superficial, and merely causes local disturbance, especially a purulo-sanguineous discharge or a frequently recurring copious hæmorrhage. These may sooner or later still end fatally, even after the condition has become chronic ; but not uncommonly when involution is complete, a state of repose and toleration sets in, in which the trouble is quite bearable. Indeed in many cases the displacement is well borne from the start, so much so that it may remain entirely unnoticed, or only be discovered accidentally after some years. The uterus continues to lie quietly in the vagina, and gradually diminishes in size ; its surface grows smooth and hard, or is merely excoriated, where exposed to mechanical irritation,

¹ Saxtorph ; Radford, *Dublin Journal of Medicine*, 1835.

² Gérard de Beauvais, *Académie de Médecine*, 1843.

until at last the organ undergoes atrophy, and a state of in other respects perfect health returns. Barnes in his *Diseases of Women* (ed. 1873, p. 720) records a number of such instances. I myself know a woman, whose uterus has been inverted for 14 years, but who merely complains of copious menstruation, and even this is not severe enough to make her willing to undergo any operation; another one, in whom the inversion occurred in her 1st confinement two years ago, was only induced, after losing her first child, to apply to me on account of her sterility, although the menses in this case too were copious and prolonged.

The description of *chronic* inversion however belongs to gynecology in the narrow sense of the word. I shall therefore only add that the accident must be regarded as recent, so long as the puerperal involution processes are still in progress, i.e. it only becomes chronic after the lapse of a month.

Spontaneous reposition is comparatively often seen, where there has merely been a local depression; such cases can readily be explained by the con- and retraction of the depressed portion, and by the diminution of the intra-abdominal pressure. But the spontaneous reduction of a complete inversion has also been occasionally observed both at an early and late date¹, and must likewise be attributed to relaxation of the organ, especially to the pull exerted by its retracting ligaments, where the cervix is fixed.

§ 714. The *prognosis* is always doubtful, although more so in regard to the immediate danger, than to recovery after such has been averted. Crosse states that one out of every three cases terminates fatally, either immediately or within a month. Amongst 109 fatal cases which he collected, the unfortunate result occurred in 72 within a few hours, generally within half an hour; 8 times within the 1st, 6 times between the 1st and the 4th weeks, once in the 5th and 8th respectively, 3 times after 9 months, and 18 times between 1 and 20 years.

The prognosis is most serious, where the inversion has taken place suddenly and completely, especially if the uterus continues in a state of atony; where the accident takes place gradually and has been furthered by uterine action, the prognosis is better. When once the case has become chronic, it is no longer very

¹ Cf. my communication in the *Archiv f. Gynækologie*, v., p. 118.

alarming, and the danger is then merely due to the menstrual hæmorrhage, which usually begins to grow profuse 6—9 months after the labour. The prospect of recovery from the displacement, where this is of long standing, is much greater now than formerly; indeed it is practically certain. As recently as the time of Denman, it was believed that reposition was no longer possible, after 2 hours had elapsed; but nowadays it almost always succeeds, even after many years, while the actual removal of the uterus has become a less dangerous proceeding owing to improved methods.

§ 715. The *diagnosis* of a recent inversion can never be difficult, and even that of inversion of long standing is easy. The aggregate of symptoms in the former calls for an examination, and this will reveal a soft, elastic intra-vaginal tumour, which may possibly contract, and which, gradually getting smaller as it ascends, ends at the point of reflexion of the cervix, while above it no wide cavity can ever be felt. On palpating the abdomen, the body of the uterus cannot be discovered, the hypogastrium is found empty, and if the tumour is pushed up *per vaginam*, the funnel-shaped orifice of the inversion will be detected above the symphysis, the anterior edge of the inversion generally rising somewhat higher than the posterior; the finger can be pressed into the funnel. If the uterus lies at, or outside, the vulva, it is still easier to recognise the nature of the disorder, since the line of reflexion on to the portio vaginalis can then easily be felt all round it; in such a case too the velvety (and at the placental site villous) surface of the mass and its visible hardening are characteristic. Difficulty is more likely to occur, when the inversion is incomplete, since such a case is very liable to be mistaken for a *polypus*, this latter being sometimes only noticed after delivery. But with a *polypus* the fundus uteri will be felt externally to be in its proper place, while internally the point of attachment of the new growth will be found. Any doubt that still remains, may be removed by the use of the finger or sound; in the case of a *polypus*, they will show that the cavity of the uterus is only slightly, or not at all, shortened, while in cases of inversion it is quite short or even absent. A *still adherent placenta* too may render the condition obscure, but only for a moment, since a careful bi-manual exploration of the pelvic cavity must soon clear up the case. Recto-abdominal and recto-vaginal palpation is sometimes of advantage. Again, where the conditions are obscure, a careful

pull on the tumour may help, since this, apart from the pains and the increase in the subjective symptoms which it causes, will cause the point of reflexion to descend.

In spite of the facility of diagnosing a recent inversion, lamentable errors have occurred. The uterus, especially when firmly contracted, has been mistaken for the head of a second child, and has been drawn down with the forceps; also for a bulky placenta and similarly treated; or for a polypus, leading to attempts at removal by ligature. All these errors arise from carelessness and hurry; they will always be avoided if the principle is followed of examining and thinking over every case in all its bearings, before any operation is attempted.

Treatment.

§ 716. *Our first duty is of course to re-invert the uterus*, and this should be done as speedily as possible, since the operation becomes increasingly difficult as time goes on. Nothing but a very alarming state of collapse can justify a departure from this rule, and make it desirable to begin by counter-acting this source of danger; too much time however should not be expended over such attempts (a little alcohol, an injection of ether, the application of warmth do not take long), for the collapse will disappear, when reposition is effected.

Where the placenta is still attached to the uterus, the question presents itself whether it would be better to remove the placenta, before attempting reposition, or to allow it to remain *in situ*, and be re-inverted with the fundus. The former plan takes time, and may increase the hæmorrhage; on the other hand it diminishes the size of the mass to be returned and facilitates the operation. In any individual case therefore the practitioner should be guided by the copiousness of the hæmorrhage, and by the facility with which the placenta can be peeled off, and reposition effected. If the placenta is only partially adherent, and the cervix uteri and the point of reflexion of the inversion are wide and yielding, the preliminary detachment is best omitted, since it might cause those parts to become contracted and narrowed, since moreover the hæmorrhage is diminished by the pressure applied to the placenta, and the latter helps to protect the uterine tissues during the manipulations that necessarily accompany

reposition, and since, when there is no obstruction, it does not matter much if the body of the uterus is rendered somewhat more bulky. But where the placenta in any way interferes with reduction, it should be forthwith removed; this cannot be difficult or consume much time, if the peeling is carefully managed, and is begun at the edge.

Supposing now the uterus to be relaxed and the cervix not contracted, *reduction* is to be attempted in the following manner. Two or three fingers are brought into the form of a cone and pressed against the deepest portion of the tumour; or else the closed fist may be used, so as to avoid injuring the uterine tissue; that deepest portion is now to be pressed in and forced upwards. The body of the uterus will then usually suddenly fly back with a jerk, much as an india-rubber ball would do, if similarly treated. In every case of re-inversion two points require attention. In the first place the uterus must be fixed externally, although only just enough to avoid lateral displacement or too great a stretching of its attachments (even the vagina has been torn under these circumstances); it is a good plan to force the fixing finger into the funnellike cavity of the inversion, and to stretch this while the fundus is being forced upwards, or at any rate to push the higher anterior margin downwards. In the second place it is important that the uterus be pushed upwards in the axis of the pelvis. The pressure must therefore be first directed towards the sacral concavity, then perpendicularly to the pelvic brim and at the same time along one side of the promontory, so as to prevent the latter from hindering the reduction (Skinner, Barnes).

§ 717. If however the whole uterus is firmly contracted, and the cervix constricts the inverted portion, any attempt to press in the fundus would cause difficulty, by increasing the bulk of the mass to be reduced, and thus frustrate our object. Under such circumstances the best procedure is that which was taught years ago by Kilian, and has more recently been adopted by M'Clintock. The operator grasps the swelling as high as possible with his adducted and straightened fingers, and compresses it firmly, while the fundus is allowed to rest in the hollow of the hand, and his finger tips try to expand the os. The upper portions of the tumour (*i.e.* those that descended last through the os) are then to be pushed back first through the os, the flat

of the operating hand at the same time pressing on the fundus. This mode of procedure closely resembles that used in reducing a hernia. If this manœuvre also fails, that suggested by Merri-man *inter alios* may still be successful. It consists in alternately pushing first one side of the fundus then the other upwards, or else in re-inverting the body of the uterus by beginning to act on one corner (Næggerath). An attempt may also be made to firmly compress the uterus with both hands, then to press in the fundus, and to complete the reduction in the way first mentioned. With any one of these manipulations the re-inversion not uncommonly takes place quite unexpectedly and rapidly. Chloroform anæsthesia greatly facilitates reduction; a very tight cervical constriction may be combated by the measures recommended above for stricture (§§ 468, 698). Any inflammatory swelling of the uterus, which hinders reduction, may be diminished by applications of ice or warm aromatic fomentations, or by superficial scarifications or purgatives according to the circumstances of the case. Actual violence must never be resorted to, nor should instruments be used to force the taxis (*Repoussoirs*). If the reposition does not succeed with any of these means, the case must be treated as if it were a chronic inversion, and the best course to adopt is unquestionably to exert continuous and steady pressure on the fundus by means of elastic bags. These will probably always have the wished for result, before the puerperal involution of the uterus is complete.

§ 718. When the reduction is accomplished, the accoucheur should keep his hand in the uterus for some time longer, until its walls contract firmly all round; retraction is assisted by external pressure, cold irrigations and preparations of ergot. Where there is reason to fear a relapse, stronger stimulants must be used, for instance the uterus may be injected with dilute liquor ferri perchloridi, or a thick metallic tube may be left lying in the uterus for a short time. The woman must remain absolutely quiet, and avoid any active use of her abdominal muscles.

Lastly, I must mention that even where there is merely a depression of the fundus, the practitioner should introduce his hand into the cavity of the uterus, and push up the indented portion; nor should the hand be withdrawn, till the affected area shows signs of contracting. Narrowness of the internal os may be overcome by the same measures as are used when that

condition accompanies retention of the placenta. If the latter is still adherent, it should not be at once detached. If the uterus induced, if possible, to expel it by contraction, and if ever manual removal is necessary (e.g. on account of hæmorrhage, or where the placenta itself appears to be an obstacle to contraction), its expulsion may be attempted, and this can be done without serious injury.

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4. Lacerations, Perforations and Ruptures of the Parturient Canal.

Every portion of the parturient canal is liable to have its continuity broken at the time of labour. The portion most often, and is followed with decreasing frequency, the lower half of the vagina (particularly its posterior half), the vestibule, the portio vaginalis, the cervix uteri, the vagina, the body and fundus of the uterus, and the pelvis. The cause and significance of these lacerations is greatly that the several varieties must be described according to their seat. The most important of these are—

a. Lacerations of the Uterus.

§ 719. Lacerations of the uterus are almost always situated at the cervix and lower uterine segment, particularly the middle and upper portions; at any rate they usually extend downwards and are then prolonged either into the body, or

¹ Papers that deal specially with chronic inversion are omitted.

² Burns was the first to teach that they almost exclusively

If however we except those cases in which the injury is direct (*e.g.* perforation with forceps, perforator &c.), ruptures due to violence only occur, when the existing conditions are favourable to such an accident; in other words the external provocation merely hastens the rupture of the wall, although of course such injury might possibly have been avoided with proper skill¹.

The cervix and the lower segment of the uterus are liable to show a marked want of resisting power in relation to the intra-uterine pressure, whenever the changes, which they undergo during delivery, overstep the normal limits. The body of the uterus on the other hand only does so under far rarer, indeed quite exceptional, pathological conditions, as for instance with errors of development (attenuation at the apex of one horn), interstitial new formations, cicatrices due to Cæsarian section or previous rupture, degenerative changes in the wall, or undue rigidity of the cervix². These are the factors which predispose the body of the uterus to rupture, and inasmuch as they are extremely rare, that portion of the uterus only ruptures primarily in quite exceptional cases.

The expansion and elongation of the cervix, and the retraction of the obstetrical internal os remain within physiological bounds, when there is no unusual obstruction to the progress of the ovum (*sc.* presenting part). Where however such obstruction exists, either from pelvic contraction, or from an excessive size of the presenting part of the fœtus, or from abnormal position or presentation of the fœtus, the lower segment of the uterus, including the cervix, is retracted upwards over the fœtus, as far as is permitted by the pelvic and vaginal attachments. When such retraction has reached its limits, or when, owing to impaction of the lower cervical segment between the child and fœtus, that segment is fixed, so that the upper and middle cervical portions can alone share in the retraction, the obstetrical internal os ascends so high that at last *the presenting part is driven down into the enormously elongated obstetrical cervix and wholly enclosed by it.* The walls of the cervix and lower uterine segment by this means become extremely attenuated, and may

¹ Cf. Trefurt, *Ueber die sogenannte Ruptura uteri violenta. Abhandlungen und Erfahrungen aus dem Gebiete der Geburtshilfe*, &c. Göttingen, 1844, p. 289.

Kernmann, "Ueber die Uterusrupturen in forensischer Beziehung." *Dissertation* Leipzig, 1864.

² Cf. Hug (l. c.), Case vi.

rupture at any moment. And this will be especially apt to occur, if the accoucheur tries to force a passage by the side, and past the part, of the child which is distending and stretching the cervix, or if he suddenly stretches the already stretched wall (*e.g.* for the purpose of applying the forceps, or of forcing the head upwards with a view to turning).

The obstetrical internal os is sometimes so greatly retracted, and, together with the body, so greatly contracted, and so large a part of the fetus is already expelled into the cervix, that the fetus can no longer be returned into the uterine cavity. If the accoucheur attempts to do this, the necessary manipulations and the version of the child will still further stretch the cervical wall and break it through, or else, as the part of the child concerned is forced upwards, the cervix tears transversely from the vagina (figs. 115 and 116 are borrowed from Bandl, and show diagrammatically the relations of the cervix in the condition which precedes rupture).

If the lower cervical segment has been more or less rubbed through (*Usur*) in consequence of prolonged local pressure, it will of course be particularly liable to give way; indeed rupture not uncommonly originates through such rubbing.

§ 721. The above remarks will explain why it is that rupture scarcely ever occurs, except when labour has lasted a long time, and inasmuch as the external os may continue very small, even after such long duration (especially when there is no proper bag of membranes, and when the presenting part is high and cannot advance into the os), the tear may sometimes occur *while the os is still narrow*. The same combination may be found, when the membranes are still intact, if these happen to be very resisting, and the lower uterine segment on the other hand is abnormally thin and weak-walled. The prolonged duration of labour which is necessary for the occurrence of rupture, explains also why such rupture is comparatively rarely seen where there is considerable pelvic contraction; for in such cases labour is usually terminated artificially at an early period, and the head, which remains high above the pelvis, is thus prevented from descending into the cervix in the usual way. Where on the other hand the narrowing is slight, the head can be driven down into the brim and fix the lower segment of the cervix, while the upper retracts over it.



Fig. 115.—Abnormal relations of the uterus and cervix with a head presentation. (Bandl.)

Rupture is far commoner in multi- than in primiparæ; the latter only furnish 12 p. c. of all cases (Bandl, 65 : 546). The cervix is on the whole better able to resist in primiparæ than where it has already been repeatedly subjected to stretching; nor does the obstetrical internal os retract so rapidly over the child, since the attachments of the uterus to the pelvis are stronger, and the more powerful abdominal pressure forces the former more firmly against the latter.

In multiparæ on the contrary, the uterus is frequently displaced to one side, and especially forwards

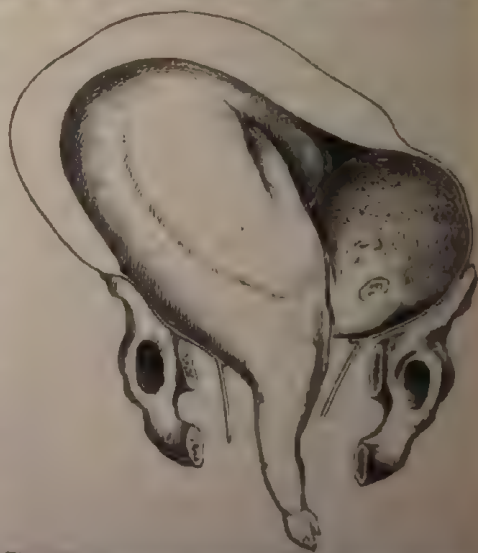


Fig. 116.—Abnormal relations of the uterus and cervix with a shoulder presentation. (Bandl.)

(pendulous abdomen), which causes the cervix to be more stretched on one side than on the other¹. This liability of multiparæ is the reason why, as has been pointed out more than once, ruptures are mainly seen in *elderly* lying-in women.

The greater frequency with which rupture accompanies the birth of boys, is doubtless to be associated with the fact that on an average these have somewhat larger, and particularly more resisting, heads, which do not so readily become adapted to the pelvic ring².

§ 722. A rupture may involve *any* portion of the lower segment of the uterus (fig. 117), but it is most often situated on one, and especially on the left, side. Doubtless this is so, because the uterus usually inclines to the right, and the presenting part must therefore be directed towards the left; moreover, in shoulder presentations the head is most frequently on the left. The rupture may run in every possible *direction*, although longitudinal tears are undoubtedly the commonest, especially with transverse presentations; on the other hand where the cervix is chiefly stretched longitudinally, circular and oblique tears of the anterior and posterior walls are most often seen. The preservation or otherwise of the *peritoneum* depends mainly on the seat of the rupture, and on whether the fetus passed rapidly or gradually, or did not pass at all through the aperture. When the tear affects the anterior or posterior wall, the serosa is as a rule torn, but when it is lateral, the serosa may continue intact, since at that region it is but loosely adherent and can yield, and since the advancing part of the fetus can force the laminae of the broad ligament apart. The opening in the peritoneum generally extends somewhat further than does that in the other layers of the lower segment of the uterus. In other words the serosa is usually somewhat raised from the subjacent layers, even with a penetrating wound; never however from the body of the uterus, to which it is too firmly adherent. With ruptures due to violence moreover, separation of the peritoneum is certainly rare, at any

¹ Where the head continues to lie on one side, where the walls of the cervix are unequally distensible, or where the pelvic attachments of the uterus are unequally strong, the expansion of the cervix may be extremely unsymmetrical, indeed be mainly unilateral, as is shown by a case published by Hofmeier (*Zeitschrift f. Geburtsh. und Gynäkologie*, iii., p. 305).

² Out of 34 cases collected by Collins 23, out of 20 by McKeever 15, out of 13 by Bandl 10, i.e. out of a total of 67 cases, 48 were of the male sex.

rate it is much less extensive than in the spontaneous cases; in the former class the injury takes place too rapidly to allow of such separation. Occasionally several tears are found in the serosa side by side.

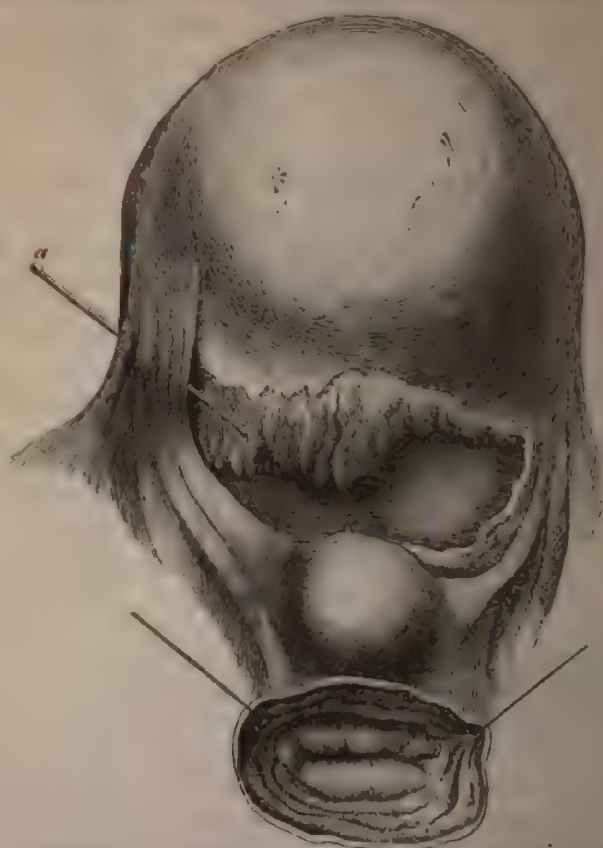


Fig. 117.—Transverse rupture through the upper portion of the anterior wall of the lower segment of the uterus (*Geburtshulfliche Poliklinik*, 1869—70, No. 126)¹. The sound (*a*) passes beneath the peritoneum which is raised from above the tear.

Ruptures are usually of considerable *length*. After delivery however they almost invariably appear smaller than they were at

¹ Taken from a woman æt. 42, vii-para, who was delivered twice with forceps, and once by version and podalic extraction; the latter was in the confinement previous to the present one, 15 months ago.

Generally contracted, flat pelvis, C. v.=8.5 cm. (3.5 in.). Spontaneous rupture 3 hours after escape of the liquor amnii. Head presented with the face over the left

the time of their formation. This is especially true of those involving the body, and of those which run longitudinally through the cervix. It is less true of the circular ones, which therefore usually appear to be the most extensive. Again, the obstetrical cervix which is mainly stretched in the direction of its length, shortens most in the same direction after labour. Neighbouring organs (bladder, rectum, vagina) are also sometimes involved. The edges of the rent are infiltrated with blood, thin (owing to the antecedent stretching), and generally jagged (owing to the retraction of the tissues taking place in the most various directions); the largest of the blood-vessels contained in them are thrombosed. Sloughing of the surrounding tissues must be regarded as a secondary effect. The body of the uterus is usually firmly contracted and thick-walled; it projects far up into the abdominal cavity, and lies a long way towards the side opposed to that which is ruptured.

As regards symptoms and proper treatment, there are many differences between complete and incomplete tears, so that these two varieties must be described separately.

A. Complete Perforating Ruptures.

§ 723. These are most often situated at the posterior, and next often at the anterior, wall of the cervix, partly because the peritoneum descends further, partly because it is more intimately attached to those portions than it is at the sides of the cervix. Longitudinal tears probably predominate, although transverse ones are by no means rare. The seat of the former mainly involves the latero-posterior edges which are directed towards the pelvic bays (*i.e.* on either side of the promontory); the latter variety is principally found in front, and occurs especially with generally contracted pelves. In one or two instances a trans-

iliac fossa; the lower limbs passed into the abdominal cavity through the tear. I was able without much trouble to draw back the feet and rapidly to extract the child, which was already dead. Its weight was 3,900 grm. (8½ lb.), its length 60 cm. (23½ in.), the sex being male. The mother died on the 6th day from septic peritonitis. The post-mortem showed that the tear passed immediately below the level of the obstetrical internal os, and involved the entire anterior wall of the lower segment of the uterus, and a portion of the posterior on the right side; in the latter situation the serosa was in part preserved. The rent passed at the level of the pelvic brim, although during labour it was placed much higher, as is shown by the fact that although the head presented, the legs were able to escape through it.

verse tear has been seen to communicate with a longitudinal. The opening in the peritoneum does not always exactly correspond with that in the muscle, either in situation or in size; it most often does so, where a rupture passes through a fibroid or through an old cicatrix. These relations, as well as the degree of separation of the serosa from its subjacent layer, vary according to the rapidity with which the injury took place, and according as a large or small part of the child passed through it.

The fetus is most likely to escape completely and suddenly *into the abdominal cavity*, where, with a still movable child, the cervix bursts in front, either transversely or obliquely, under the influence of strong expulsive activity, and where therefore the peritoneum is not extensively detached, owing to the firmness of its attachment and the rapidity with which it is stretched. The child is more likely to pass gradually, where the rupture begins with a small aperture, and the cervical tissues are still resisting. There every successive pain or bearing down effort increases the length of the tear, by means of the pressure exerted by the advancing part of the fetus; the peritoneum too is more extensively detached, so that that part of the fetus comes to lie beneath the serosa, until either gradually or suddenly the fetus is pushed through the rent into the abdominal cavity. If however the head is already fixed in the pelvis at the time that rupture takes place, then only the trunk will be driven through the tear, either by the same pain which caused it, or by the succeeding ones. If the opening is a small one, and if the head is driven down rapidly and is followed by the trunk, no part of the child need leave the uterine cavity, and delivery can then take place spontaneously through the pelvis; indeed a second twin has been seen¹ to be delivered spontaneously, although a rupture had occurred during the birth of the first. The placenta is sometimes expelled into the abdominal cavity, or else it may remain lying in the cervix; occasionally too it is expelled *per vaginam*.

Blood always collects beneath the detached peritoneum, the more copiously, the less the cavity formed by the detachment is filled by the child. In these cases there is frequently a hæmatoma above the anterior vaginal *cul de sac*, but particularly in the tissues of the broad ligament which communicate with the

¹ Matthews Duncan (private communication).

opening in the cervix. Nor is it very uncommon to find copious subserous extravasations in the iliac fossa, and at the sides of the lumbar vertebrae. But the largest collections of blood are generally found free in the abdominal cavity, and with the blood is mixed liquor amnii; where the woman has survived the accident for several days, the products of peritonitis are so also.

§ 724. *Symptoms and diagnosis.*

Occasionally distinct signs point to an impending rupture. They result from excessive stretching of the lower segment, and great retraction of the obstetrical internal os. Prolonged energetic "pains" have therefore preceded, and with them has gradually become associated a more and more severe pain in the lower portion of the uterus, caused by the stretching. The body of the uterus reaches high in the abdomen, higher than before, and is displaced to one side; the pain and the dread of threatening disaster lead to great frequency of the pulse and to excitement. Not uncommonly too through the abdominal walls, the region of the internal os can be felt, *i.e.* the boundary between the alternately hardening and relaxing uterine body on the one hand, and the passive and thinned lower uterine segment situated below it on the other. It forms a broad furrow running 2—3 finger breadths below the navel, either transversely or (if the body has retracted more on one side than the other) somewhat obliquely. Indeed the boundary may sometimes actually be seen (Bandl), but this is not always possible, *e.g.* when the walls are thick or distended with wind; moreover a close application of the uterus to the neck or to some other small portion of the fetal body may simulate this phenomenon.

After the occurrence of rupture, the "pains" usually subside instantaneously; the preceding suffering and forcing are replaced by marked repose. The lying-in woman herself is sometimes conscious of what has happened; she may feel the tear, or feel the fetus move beneath the abdominal walls. Symptoms of collapse however (due to the hemorrhage and shock) almost immediately show themselves: vomiting, utter prostration, altered features, cool skin, a wretched frequent (abdominal) pulse. Soon follows a fresh (although now diffuse) pain in the abdomen. More or less blood escapes from the vagina; the presenting part of the fetus, if not yet fixed, recedes from the brim of the pelvis. The form of the abdomen is altered: perhaps the now

relaxed body of the uterus can no longer be grasped, or it is felt to be small and empty, contracted, and pushed to one side, while at its side is felt the child, which has passed entirely or completely into the abdominal cavity. These results of palpation establish the diagnosis, which is occasionally confirmed by the examining hand actually discovering the laceration in the lower segment of the uterus, or feeling prolapsed coils of intestine. The fetal heart beat which has hitherto been audible, disappears almost immediately after rupture (M'Clintock), for the child dies very quickly after its exit.

It is only the constitutional symptoms that might lead to error, since they occasionally accompany other conditions. Nevertheless we are principally dependent on them in the cases where the presenting part, owing to its being fixed in the pelvis, does not recede, and prevents discharge of blood, and where the child does not pass out through the tear, or only does so with perhaps a single limb. Moreover they may be absent or but very little marked, even where coils of intestine have prolapsed through the aperture and been replaced, if only the rupture takes place slowly. But sooner or later they show themselves (at most 2—3 hours after the commencement of the tear); pain and symptoms of collapse especially do so. The condition then resembles that associated with an incomplete laceration.

§ 725. The *prognosis* is extremely unfavourable. In the first place the shock and hæmorrhage may rapidly prove fatal, especially where combined. When they do not, metritis and secondary peritonitis usually bring on speedy death, all the more rapidly, when (as is not rare) they have in part been caused by the prolonged pressure of labour. If the fetus has been expelled into the abdominal cavity and the immediate danger is over, there are still all the additional dangers described under "Extra-uterine Pregnancy" (§ 313 *et seq.*) to be faced, and these may unexpectedly cause death, even when the prospects appear to be very bright¹. Amongst serious complications are rupture of the bladder, due to secondary infiltration of the pelvic connective tissue with urine, and the strangulation of coils of intestine in the contracting uterine tear. The latter event has been seen to

¹ Thus Rokitanaky has met with a case of hæmorrhage from a uterine artery, which had subsequently been opened by the ulcerating margin of the tear.

terminate favourably after the formation of, and recovery from, a fecal fistula.

Recovery is therefore an exceptional event. It occurs by the affected tissues retracting and thereby narrowing the wound, and by closure of the latter through adhesion with neighbouring surfaces; sometimes only after extensive sloughs have been discharged through the vagina or from peri-uterine suppurating centres¹. But the proportion of recoveries stated by Jolly (100 out of 586, *i.e.* 1:6=17 p. c.) is far too high; the ratio mentioned by Hugenberger and quoted above of ca. 5 p. c. is nearer the truth. Recovery occurs most frequently where the fetus has remained entirely, or partially, *in utero*, and has been rapidly extracted through the pelvis; or else where, after its expulsion into the abdominal cavity, it was removed by version and podalic extraction, or by laparotomy, although the number of women operated on in this way is as yet but small. Again cases where the tear passed through a cicatrix, yield a more favourable prognosis, the reasons being that the uterine tissues are then less deeply involved, that the fetus passes out in the way indicated by the former accident, that fresh injuries only occur to a limited extent and that bleeding is scarcely ever copious. Lastly in these as in all other kinds of severe injury, some recoveries take place, where they were least expected.

I have already stated that as regards the *child* the prognosis is all but hopeless. It either perishes during the long parturient activity which precedes the tear, or else succumbs after the occurrence of the latter, sometimes owing to the uterine hemorrhage and the detachment of the placenta (which accompanies the contraction of its area of attachment), sometimes perhaps owing to the umbilical cord being squeezed in the wound. Survival is only possible, when rapid delivery can be effected. In 237 cases collected by Jolly, in which the condition of the fetus is referred to (and those killed by craniotomy are here excluded), only 7.5 p. c. were born alive.

¹ Recent cases of recovery after perforating rupture have been published by Schlottfeld (*Centralblatt f. Gynäkologie*, 1879, p. 286), Rakin (*ibid.*, p. 334) and Dixon (*ibid.*, p. 499). The most remarkable out of them is that recorded by Rose (*American J. of Obstetrics*, xi, p. 396), in which rupture occurred in four successive labours, and recovery took place even in the fourth.

Treatment.

§ 726. The above description of the way in which rupture usually originates, will show that *prophylaxis* has here a most fruitful field of operation. It cannot prevent every rupture, but it probably can all those which are due to excessive stretching of the lower uterine segment or of the cervix, and this category includes the vast majority. The condition of those parts therefore must be investigated in good time at every labour, and should especially be kept under observation, whenever there is any considerable delay. If the condition of undue stretching is found to be in course of development, the practitioner must carefully fix the uterus in the middle line, and diminish the effect of the pains by administering narcotics and encouraging the woman. But if he finds that the retraction of the internal os is increasing, and becomes convinced that the existing obstruction can only be overcome after prolonged exertion, he must get rid of that obstruction, and terminate the labour artificially. Of course great care is necessary in these cases, all the greater, the more the existing condition has become favourable to rupture. Special care is required during the performance of version, where the cervix is liable to be increasingly and suddenly stretched at the moment that the child is turned; but also during perforation, so as to prevent the head being forcibly pushed up, without being sufficiently fixed externally. Even the forceps may easily cause rupture, if, when the instrument is applied to the still high-lying head, this latter is much moved to and fro, so that that instrument should be avoided with such a position of the head. Under some circumstances, especially where delivery through the pelvis seems likely on *a priori* grounds to be very difficult, and where the presenting part is not readily accessible, the best course will be at once to perform Cæsarian section with the view of escaping from a greater danger, as Litzmann has done (*Centralblatt f. Gyn.*, 1879, No. 12).

§ 727. When rupture has occurred, the accoucheur must proceed to deliver as rapidly as possible; an expectant attitude has no chance of success. Only where there is extreme collapse, may this condition first of all demand his attention; but a few injections of ether &c. will soon enable him to undertake delivery. The *modus operandi* will vary with the presentation of the child

and the condition of the parturient passages. If the head can easily be reached with the forceps (this alas! will only rarely happen), an attempt may be made to deliver with that instrument. But as a rule the best plan will be to perforate the skull and extract with the cranioclast; for under these circumstances the hope of saving the child is all but forlorn. If the head cannot be reached, and the fetus is still *in the uterine cavity*, version should be performed with the utmost care (both feet being brought down, if possible), and followed by podalic extraction. Indeed even if a small portion of the upper half of the body has passed out through the tear, the feet should be brought down, and the child extracted with their help. When on the other hand *the largest part of the fetus has been driven into the abdominal cavity*, the feet should only be brought down and extraction effected with their help, provided they are easy of access, for instance where the tear mainly lies in the lower segment of the uterus, where its edges are relaxed, and the wound has not become narrowed as a result of contractions.

The placenta must be removed through the pelvic canal immediately after the birth of the child, lest the contractions should force it through the rent into the abdominal cavity. External pressure however must be applied with great care, since otherwise it might produce the same effect; indeed the better plan might be to extract the placenta in the way recommended in § 704. If the placenta lies in the abdominal cavity, it should be removed through the rupture, provided this can be done without causing undue mischief.

Prolapsed coils of intestine must be pushed back through the tear. If they again descend, they should be got back at least as far as the cervix, and a plug of carbolised cotton wool laid before the external os; this may prevent strangulation of the loop, which indeed frequently withdraws itself spontaneously from the wound.

An attack of hemorrhage after delivery is always serious. When derived from the placental site, the blood may escape into the abdominal cavity; if derived from the rupture, the bleeding is difficult to arrest. In the first condition the accoucheur should introduce his hand into the uterus, so as to remove all blood clots from it, and then supervise the organ bimanually, until its retraction is assured. In the second condi-

tion the better plan is to exert external pressure on the seat of the injury and to apply a bag of ice externally, while a tampon, provided with some styptic, is carefully laid against, and inside, the cervix; he should not be in a hurry to remove the clots which lie near the seat of injury, since they assist in closing any vessels that are still open.

Where hemorrhage is very copious, the practitioner may have to consider the advisability of performing *laparotomy*, with a view to subsequently being able to close the lips of the wound by sutures, and to remove any masses of blood that may have escaped into the peritoneal cavity. I cannot advise the operation apart from this result, *i.e.* merely with the object of sewing up the wound, although Stadfeldt (*Centralblatt f. Gyn.*, 1878, p. 407) has recommended it as a regular practice. On the other hand the favourable results which Schröder¹ and others have obtained in cases of rupture through the cervix and lower segment of the uterus, show that it is a good plan after the delivery of the child to irrigate the abdominal cavity through the wound with a tepid 2 p. c. carbolic lotion, and afterwards to pass a drainage tube a long way up, and to leave it there. The success which has followed this method, is probably to be attributed to the facilitated discharge not so much of the peritoneal secretions, as of the secretions from the wound in the torn subperitoneal tissue, which otherwise are apt to become a source of secondary infection to the peritoneum.

§ 728. If the child has been entirely (or nearly so) expelled into the abdominal cavity, it must, whether still living or not, be rapidly removed by *laparotomy*, except under the exceptional circumstances already referred to, where it can easily be reached and extracted through the rupture. Any attempt to draw it back through the tear would destroy its last chance of survival, and be extremely dangerous to the mother. The practitioner cannot possibly hesitate to adopt this advice, if he gives a moment's consideration to the manipulations, which he will otherwise be obliged to carry out in the midst of the abdominal organs, quite apart from the additional risks caused by his stretching the edges of the rupture, and again introducing his hand for the purpose of extracting the placenta, and apart from the impossibility of

¹ Cf. Frommel, *Centralblatt f. Gyn.*, 1880, No. 18; Morshach, *ibid.*, p. 611; Graefr. *ibid.*, p. 614; Felsenreich, *Archiv f. Gynakologie*, xvii

removing the intra-abdominal and subserous effusions. Some of the exceptional cases in which extraction *per vias naturales* proved easy and was actually crowned by success, have already been alluded to; in others doubtless the tear merely involved the vagina (*cf.* Danyau, *Mémoire de la Société de Chirurgie*, 1851). On the other hand a practitioner, who nowadays proposed to leave a dead fœtus in the abdominal cavity, to maintain an expectant attitude and to wait for incapsulation or elimination of the fœtus (as with extra-uterine pregnancy), would practically be blinding himself to all the progress that has recently been made in intra-abdominal gynecology; neither the formation of a lithopædion nor its safe elimination come to pass just when we would wish it. Such conduct might in times past perhaps have been wise, but now it is no longer so. Indeed as a matter of fact gastrotomy can scarcely add to the gravity of so serious an accident as rupture of the uterus, expulsion of the fœtus into the abdominal cavity, and hæmorrhage into the latter; it will rather tend to improve the condition, and to bring about the requirements that are most favourable for recovery, since it gets rid of the provocations to acute, diffuse and prolonged peritonitis (fœtus, blood), while the sources of fresh hæmorrhage (edges of the tear) are eliminated by suture. The operation is by no means so severe under these circumstances as with the rupture of an extra-uterine fœtal sac, in which it is also called for. Moreover there is the great advantage that it need not be undertaken, as must delivery through the pelvis, immediately after the catastrophe, in other words that the collapse may first of all be allowed to subside; nor does such delay diminish the prospects of success. The results which have so far been published, cannot be termed unfavourable¹, even if we suppose many unsuccessful cases to remain unrecorded, as always happens under similar conditions, and therefore to remain unknown.

I need hardly add that the operation must be performed with

¹ Jolly has collected 38 such cases published up to 1870, with 26 recoveries; Harris (*l. c.*) 40 cases from America with 21 recoveries. Additional successful operations have been published by Fournier (*Bulletin génér. Thérap.*, Aug. 13, 1872), and Hart (*Centralblatt f. Gynäkologie*, 1877, p. 229). Unsuccessful ones by Black (*ibid.*, 1879, p. 449) and Schröder (*cf.* Reben, "Zur Therapie der Uterusruptur," *Dissertation*, Berlin, 1879, 2 cases; the third of the cases that are recorded there, relates to an operation which was not performed until 4 days had elapsed).

the same care and scrupulous cleanliness (sc. antiseptics) as are required in similar operations under other circumstances; special attention must be devoted to the *toilette* of the abdominal cavity, to ligaturing torn vessels and sewing up the edges of the wound, and, if necessary, to drainage either through the vagina, or simply through the lower edge of the wound in the abdominal walls. The most important principle of the after treatment is absolute rest for the whole body, especially for the abdominal cavity (opium), and restoration of the peripheral circulation (warmth), as is customary for intra-abdominal operations. Complete removal of the ruptured uterus has been recommended by Alessandrini (*Centralblatt f. Gynäkologie*, 1879, p. 426), and actually carried out by Prevost in Moscow (*cf.* Harris, *loc.* p. 818); the same measure has lately been adopted by Halbertsma, although his was a case of incomplete rupture (*Centralblatt f. Gynäkologie*, 1881, p. 67).

B. Incomplete Ruptures.

§ 729. These form two varieties; in the first the tear merely involves the serosa, and leaves the subjacent muscularis entirely (or nearly so) unaffected; in the second, the rupture begins at the mucous surface, passes through the muscularis, and extends as far as the peritoneum—*external or internal incomplete rupture*. The former is by far the rarer of the two varieties.

An *incomplete internal rupture* does not in any way differ ætiologically from a perforating one, although I may point out that it mainly occurs with pelvic contraction, and where the injury has developed slowly and naturally. It is most often *situated* at the sides (especially the left) of the cervix, as indeed we might expect from our knowledge of the relations of the peritoneum. The posterior wall invariably escapes, since there the serosa reaches down to the vaginal fundus (*cf.* § 42), and is so firmly adherent that it cannot get away from the agent which produces the rupture; the anterior is sometimes affected. If now incomplete ruptures at the sides of the uterus are much rarer than are perforating ones, in spite of the fact that the serosa does not reach far down in the lateral region and is only loosely attached, the explanation must be found in the fact that, at the time of advanced pregnancy, it is the region of the uterus situated at, and above the level of, the internal os, that is acted upon by the pelvic brim, and

that therefore no portion of the uterine wall, that is free from the serosa, comes into contact with the upper edge of the pelvis; and in the further fact that pelvic contraction is frequently associated with pendulous abdomen, and that then, owing to the anteverted position of the uterus, a still higher portion of the anterior uterine wall, also lined by serosa, rests against the edge of the pelvis, than happens under ordinary conditions. Again, many a partial rupture is converted into a complete one, by the prolonged action of the "pains", and by parts of the fetus passing out through it. These facts as well as the additional one that many cases of rupture are due to the pelvis pressing upon, and then rubbing through, the walls (and with this mode of origin the wound is almost necessarily of the perforating kind) explain the comparative rarity of incomplete tears; while on the other hand their usually lateral situation (apart from the relations, *e.g.* looseness, of the peritoneum already referred to) is to be attributed to the fact that the sides are rarely exposed to such pressure as would rub through the tissues. An approximate estimate (*cf.* Brenneke) makes 8 incomplete ruptures occur to every 100 complete ones.

§ 730. The *signs* and *symptoms* associated with this accident are rarely as definite as those that accompany a perforating rupture. The sudden, overwhelming pain and collapse, the unexpected arrest of "pains", the retrocession of the presenting part of the fetus, the signs of expulsion into the abdominal cavity are almost always absent in this condition. Only when the injury has reached far above the cervix, and when the tear permitted a partial exit of the fetus¹, may those phenomena be present. At other times the rupture may last for a considerable time, without betraying its presence by any unusual symptom; the pains may continue regular as before. The commonest and most reliable signs (and of course they always show themselves immediately) are the frequent, wretched, occasionally irregular, so-called abdominal (shock) pulse and the hæmorrhage. The latter is generally abundant, owing to the fact that the injury is almost invariably situated on one side of the uterus, where the large vessels pass in and out. Sometimes the fetus prevents the effused blood from escaping freely through the os, so that there

¹ Bandl (*loc. cit.* p. 13), Dalton (*Lancet*, July 21, 1866), and Radford (*London Obstetrical Transactions*, vol. viii.) record cases in which the entire fetus lay outside the cavity of the uterus, but beneath the uninjured peritoneum.

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need be no external hæmorrhage; but even then there will always be internal, subperitoneal bleeding, and if the accoucheur pushes the advancing part of the fœtus a little to one side, blood will trickle down over his fingers. The blood that is effused internally may gradually separate the peritoneum over a large area, and thus leads to the formation of a very large blood cyst, sending prolongations in the most various directions. Occasionally too a *subperitoneal hæmatoma rapidly develops between the bladder and uterus*, i.e. at the anterior wall of the cervix and vagina, where it may present as a large doughy tumour and therefore be of diagnostic importance (Hecker, Jolly); nothing of the kind is seen at the posterior wall of the vagina, since there the pelvic connective tissues do not allow of such collections.

Another pathognomonic, but likewise very rare, sign is *subperitoneal emphysema of the anterior surface of the uterus* (especially of its lower segment), or of one of the iliac regions, generally the left. Kiwisch¹ and subsequently M'Clintock² were the first to call attention to it. Both the auscultating ear and the hand can perceive the crackling, which is sometimes loud, sometimes feeble, but can scarcely be mistaken for anything else. The air either enters from without through the tear during the intra-vaginal manipulations, or else results from putrefactive changes in the fœtus (Dohrn, Löhlein). Where the rupture extends to near the serosa, the emphysema will reach furthest up at the *sides* of the uterus; where on the other hand the external layers of the muscularis are still intact, the gas may be squeezed through the loose bundles of muscle, and travel far up beneath the peritoneal lining even of the *anterior* uterine wall, the extent being determined by the degree of the intra-uterine, and by the variations in the general intra-abdominal, pressure. Occasionally the emphysema extends to distant regions³. This symptom is always a very unfavourable one, all cases, in which its presence has been recorded, having proved fatal; especially serious is it, when due to the intra-uterine development of gas: if the lining serosa bursts and the air passes into the abdominal cavity, death may take place quite suddenly⁴. The practitioner

¹ Cf. *Klinische Vorträge*, i., 4th ed., p. 275.

² *Dublin Quarterly Journal of Medical Science*, xxiv., 1358.

³ Cf. a case recorded by Williams, *Obstetrical Journal of Great Britain*, May, 1878, p. 293.

⁴ Cf. Dohrn, *Archiv f. Gynäkologie*, iii., p. 422.

however must not allow himself to be deceived by extensive putrefactive emphysema of the fœtus, for the crackling due to this cause, can sometimes be felt through the abdominal parietes. The diagnosis will be cleared up, as soon as the fœtus is expelled, for subserous emphysema (in contrast with that just mentioned) will of course still be present; indeed it may not develop until after delivery.

But not one of the above-mentioned symptoms is an *invariable* concomitant of incomplete rupture. Even the hæmorrhage may be absent or very slight, if the fœtus presses on the tear, or fills up the cavity beneath the detached serosa, or if a clot closes the opening of the wound. The characteristic pulse too may be very slow in showing itself, and be looked upon as a sign of the exhaustion brought on by prolonged parturient exertion, or of septic peritonitis, which has developed during the labour. In not a few instances therefore the injury remains quite unrecognised during labour, until all at once alarming symptoms of imminent death, or at any rate of the perforating rupture, set in, which latter has suddenly developed out of an incomplete injury; or until labour has terminated, and the signs of the accident are thereby rendered more distinct. After the birth of the child, the external hæmorrhage generally increases, or else the subserous collection of blood only now forms, or its symptoms only now become quite obvious. The existing symptoms, as well as the miserable condition of the confined woman, then demand an exploration, and this will easily reveal the lesion and its consequences. The hæmorrhage usually only lasts a short time; it is soon arrested by the diminution in the size of the tear which accompanies retraction of the uterus, and by clots of blood blocking its orifice.

§ 731. The subsequent condition of the woman is invariably a very grave one, recovery being as rare here as it is with perforating ruptures. Thus for example the 9 women, who came under the care of Collins¹, all died. As a rule diffuse traumatic or septic peritonitis rapidly causes death, and if the woman escapes this danger, she is still threatened by the further ones arising from suppuration of the hæmatoma or from purulent parametritis.

This kind of rupture (like the one described above) makes it

¹ *Practical Treatise on Midwifery*, London, 1836. Alberts has lately published an instance which ended in recovery (*Berliner Klin. Wochenschrift*, 1880, No. 45)

urgently desirable that delivery be completed as quickly as possible, as soon as the accoucheur detects, or even suspects, the nature of the case. The sooner the woman is rescued from the condition which led to the accident, the better are her prospects of recovery. Labour will rarely terminate spontaneously within the wished for period. The pains are insufficient for the purpose: they either cease entirely, or are unable to overcome the mechanical obstruction. Their effect (if any) tends rather to increase the tear. The gentlest method of delivering is to perforate and extract with the cranioclast; this proceeding is least apt to damage the injured area, while version always increases it. The after treatment is the same as that already mentioned (§ 727), drainage and irrigation being especially applicable in this condition.

§ 732. The rare instances in which the peritoneal lining is alone torn, where there is an incomplete external rupture¹, constitute a curious phenomenon. The tear is always on the anterior or posterior wall of the uterus, to which, as we know, the peritoneum is very firmly adherent, and the muscularis is probably always slightly affected. The accident originates under apparently quite normal conditions; indeed not one of the signs which usually precede rupture, seems to herald its approach.

The superficial position and invariable multiplicity of the tears show that they must be attributed to deficiency or absence in the elasticity (possibly the result of inflammation) of the uterine serosa², which is then no longer able to accommodate itself to the alteration in the shape of the uterine body which accompanies the "pains", and to the stretching of the anterior and posterior walls, which accompanies the efforts of the uterus to assume a spherical form. These tears therefore may also occur during pregnancy, before the really expulsive contractions begin. Simpson found them on a uterus, which had been distended by an injection, given for the purpose of inducing premature labour: Hall Davis on the uterus of a pregnant woman, who had been shaken by a fall; but here the lower surface of the liver was also injured. Fritsch³ has met with a case in which the erosion

¹ They are mentioned by Duparcque (*Histoire des Ruptures &c.*, Paris, 1886), and Jolly (*l. c.*, p. 78); also by Collins; altogether perhaps 10 cases have been published. Ramsbotham was the first to describe them in detail.

² Duncan, "Ueber die hauptsächlichste Richtung und Ausdehnung der Ruptur des Uterus." *Archiv f. Gynäkologie*, vi., p. 425.

³ *Archiv f. Gynäkologie*, xii., p. 407.

of a vein led to death from hæmorrhage, and is disposed to attribute it to thrombosis.

In almost all the cases that have been published, death took place either through hæmorrhage into the abdominal cavity (in that recorded by Lever¹ a large vein had also been opened), or through peritonitis set up by the effused blood. Once or twice however neither of these conditions has been found, and the fatal issue was then probably due to shock; cf. the case related by Clarke (*Transactions of Society for Improvement of Medical and Surgical Knowledge*), and that by Collins.

(2) *Injuries due to the Uterine Walls being Rubbed through.*

§ 733. When injury has been caused by a rubbing (*Durchreibung*) or boring through (*Usur*) of the uterine wall, the cervix is found to be destroyed or perforated over a *limited area*. Such injuries are not (as are ruptures) due to a want of resisting power in the cervix (in comparison to the pressure exerted by the pains), but are the result of individual areas being exposed to very prolonged bruising. It is rare to meet with this condition apart from pelvic contraction, and indeed apart from such at the pelvic brim, where the head, especially if it is but little compressible and engages in an unfavourable manner, is often detained at one and the same spot for an extremely long period. Under such circumstances the injury will be especially likely to occur, if some portion of the ring of the brim is unusually sharp-edged or spinous. Sharp edges are not uncommonly presented by the promontory and the pubic crest, while spines are most often met with at the ilio-pectineal tubercle of the latter, and close to the symphysis pubis, these being just the points between which there is as a rule least room in cases of contraction, and in which therefore the attenuation and bruising of the cervix are most severe. Hence these injuries, resulting from continuous friction, are usually met with at the portions of the cervix which correspond with these points, most often at the posterior wall, least so at the anterior. The fact that the vagina reaches higher up along the anterior pelvic wall than it does at the posterior, explains the comparative rarity with which the rubbing action which is exerted by the former, involves the

¹ *Transactions of the Pathological Society*, i., p. 130.

cervix ; it generally affects the vaginal fundus or at most the lips of the cervix, and is then apt to produce a vesical fistula.

This kind of injury may be either *incomplete or perforating*. Here again the latter is most common behind, since in this case the peritoneum must necessarily be involved, whereas in front a portion of the cervix has no serous lining. Moreover the sharp anterior edge of the promontory is more apt to cause complete perforation than is the broader surface of the anterior pelvic wall. For the same reason too, the incomplete external injury (*i.e.* a condition in which only the peritoneum is rubbed through) is almost only met with behind. If the anterior wall is affected, the damage must, almost without exception, have been produced by some sharp spinous process.

A by no means small share in the causation of this kind of injury is attributable to forcible extraction of the head through the brim, where such extraction is practised, before the obstruction has been sufficiently got rid of ; as for example when it is effected by the forceps or the cephalothryptor, and while the head retains its previous unfavourable position. Sometimes the edges of these instruments rub and cut through the cervical tissues ; at other times the large hard part of the fetus must literally grind through the soft succulent tissues, as for instance when the operator causes it rapidly and with the whole force he is using for the extraction, to squeeze them against the unyielding brim of the pelvis.

The injuries produced, when the tissues are rubbed through in this way, may consist of small *funnel-shaped lacerations*, whose base is at the surface of the mucous membrane, and this condition is especially found, where narrow edges or spines take a share in their formation. Or else they form *broad, flat, irregular areas*, where there is *actual loss of tissue*, but over which the peritoneum remains intact ; here the pressure will probably have been exerted by broader surfaces. Occasionally the latter variety leads secondarily, after separation of the sloughing tissue during the puerperal state, to perforation of the peritoneum ; the vesical mucous membrane may also be perforated through the detachment of a torn and sloughing portion of the vagina. This kind of injury moreover would be much more frequently met with, if many of the cases were not converted into complete ruptures during the course of delivery.

§ 734. Cases where the tissues have thus been bored through can rarely be confidently *diagnosed* at the time of labour. But such a condition may always be suspected, whenever one and the same part of the cervix has been exposed to prolonged bruising during delivery. Nor is the pulse, although often "abdominal", any more characteristic than it is with incomplete ruptures, since its condition may merely be a sign of the general exhaustion. The same remark applies to the presence of an ante-uterine hæmatoma, which is of course sometimes met with. It is only when the injury has penetrated the abdominal cavity, that the symptoms are likely to grow more distinct. After delivery the injury can be actually felt.

The *sequelæ* are not so serious as in cases of rupture. Recovery is more likely to take place, even when the injury is a penetrating one, provided that the perforated region is speedily plugged by exudation, that the sloughing tissues are discharged *per vaginam*, and that no septic mischief invades the peritoneum. Unhappily such mischief is by no means uncommon, and the fatal terminations, after delivery through a contracted pelvis, are by no means rarely to be attributed to this form of injury.

There are *no special therapeutic measures* that can be adopted, where the tissues have been injured by constant rubbing, owing to the indefiniteness of the symptoms. But prospective treatment may be very important, as has been stated in the principles laid down for managing cases of contracted pelvis, *cf.* § 529 *et seq.* In any actual delivery, the practitioner should do all he can to diminish the obstruction to the part, which has to be extracted. As regards after treatment, antiseptic irrigation is of the highest value.

(3) *Tears of the Portio Vaginalis.*

§ 735. These may be longitudinal or transverse, the latter being the rarest.

Longitudinal tears may affect any portion of the portio vaginalis, but they are most often found at one side or other. The *superficial* ones are amongst the injuries which occur in almost every primipara; they give rise to no symptoms, heal rapidly, and often only again become distinct during a subsequent pregnancy, when the cicatrix is set off by the softening of the surrounding tissues.

But not uncommonly the tear runs *deeper*, reaching the line of attachment of the vagina, and even involving the walls of the latter. This happens most often, where there has been premature rupture of the membranes, and where under such circumstances the anterior wall of the portio does not recede upwards to the same extent as does the posterior, the result being that, as the head descends and the internal os becomes retracted, the anterior wall is torn off from the posterior. Moreover these tears, which involve the whole portio vaginalis, are frequently observed after forceps or podalic extractions. Even they however do not as a general rule lead to any serious symptoms, although they are apt, especially when the vaginal attachments are simultaneously affected, to give rise to localised parametritis (followed by parametric shrinking) and to eversion of the lips of the os.

It is the exception for a tear, which has commenced in the portio vaginalis, to be continued above the level of the pelvic brim towards the internal os. Such a result however may happen, when the child is extracted, before the cervix has undergone sufficient dilatation. But it is only at the edges of the os that the tear then passes through all the layers; higher up it merely involves the inner ones, and according to its extent it will then bear more or less resemblance to an incomplete rupture. Such very deep tears may also be situated in front or behind; they are not so exclusively lateral as are the superficial.

§ 736. *Transverse or annular tears* always occur at a point lying above the os, and are caused by the portio having deviated from the parturient axis and being unequally stretched on the two sides, or by its not having undergone proper expansion. Such imperfect expansion may either be due to rigidity of the portio vaginalis, which is therefore forced down by the advancing part of the fetus, and broken through at some less resisting point lying above the os; or it may arise from the presenting part of the fetus remaining too high after the escape of the amniotic fluid, to its pressing not on the edges of, but on a portion above, the os in the sagittal diameter of the pelvis, and breaking through at that portion. In the former case the rigid edges of the os may be entirely (or nearly) torn off; in the latter the effect of the constant friction (provided the pressure

continues to act on the portio) gradually extends to the sides, following the arrangement of the circular muscular fibres. In both cases however a large part (sometimes even the whole) of the circumference of the portio may by degrees be affected. It frequently happens that only the anterior lip is detached, or else this becomes impacted between the fœtus and the anterior pelvic wall, and is then forced far down by the former, nearly to, or as far as, the vulva, and crushed. In other cases the at first small tear (there may be one or more) gradually extends a long way round, and attains to such a size that the child passes through it, without tearing the ring of the portio vaginalis that has thus become formed¹. Occasionally however this ring is broken through in a longitudinal direction, and split into several flaps; or else it may be entirely torn off at one end, and give rise to a polypuslike mass, like that described by Martin². In a few cases the portio has been entirely (or entirely) squeezed off and discharged (a condition which is termed *annular laceration* in England). This happened in the observations recorded by Levy, Barker and Staude, and further in those by Schillbach-Weiser (*cf.* Martin *l.c.*), by Streng³ and Kennedy⁴. The women concerned were almost all old primiparæ, in whom, as we know, the portio vaginalis is rigid.

§ 737. The *symptoms*, to which these various tears give rise during labour, are unimportant. The circular ruptures are, it is true, preceded by shooting and dragging pains in the hypogastrium, but the actual laceration is not connected with any special suffering. Nor is the immediate *hemorrhage* very considerable; the injured tissues are too greatly stretched, as well as compressed, by the advancing child. On the other hand *after delivery the bleeding may be copious* and very troublesome, all the more so, as its source is usually not easy to discover. The proof that it does not originate at the placental area, and must therefore be due to a tear, is afforded by the absence of uterine inertia, and further by the fact that the hemorrhage begins immediately after the expulsion of the fœtus.

Longitudinal tears, as already pointed out, heal rapidly, as the

¹ It is always shorter after delivery, since it is no longer stretched, but contracted.

² *Berliner Beiträge z. Geburtshülfe*, ii., 1873, Sitzungsbericht, p. 151.

³ *Prager Vierteljahrsschrift*, 1872, i., p. 51.

⁴ *British Med. Journal*, Aug. 17, 1872.

cervix becomes involuted during the puerperal state. The torn lips of the os and their flaps atrophy, some portions having perhaps been previously thrown off: the remains of the intra-vaginal cervix and the atrophied lobes then form a fresh portio vaginalis, which is generally of irregular shape, and presents clefts. There is however always some risk of the inflammation and suppuration of the wounded surface giving rise to parametritis, peritonitis and septic mischief only follow, when the tear has nearly reached the peritoneum, and when infection has occurred. Staude states that out of eleven women with circular ruptures in whom he was acquainted with the result, three died.

§ 738. *Treatment* must mainly be of a prophylactic nature. An attempt should be made to forestall the impending tear in, and through, the portio, by incising its lips with scissors, and, if necessary, by pushing the edge of the os, which is forced downwards, back over the presenting part. As a rule lateral incisions either on one or both sides will suffice: but where the anterior or posterior lip bulges, sagittal incisions may also be of great use. Any loose flaps or rings that have formed, should be cut through and removed in front of the child, if they prove obstacles, or if the damage, which has already been caused, threatens to increase, unless they are removed. Hemorrhage *post-partum* is to be checked by irrigating with cold water, vinegar, alcohol, alone &c. If it is considerable and ascertained to come from the cervix, the practitioner may compress the wound between two fingers, or place a plug of carbolised cotton wool inside, and against the cervix; perchloride of iron (1:3) may in an extreme case be injected into the wound. The after treatment must depend on symptoms, and mainly consist of local disinfection. When possible, longitudinal ruptures should be united by sutures.

b. Tears of the Vagina.

Laceration and injuries of the vagina may either involve its fundal, its middle or its lower portion. The latter class are almost always associated with such of the introitus and perineum, and will be described under Ruptures of the Perineum (§ 746).

(1) *Tears of the Upper Portion of the Vagina.*

§ 739. Lacerations of the *fundus*, i.e. tears of the upper portion of the vagina, are usually associated with similar injuries of the

uterus, and form their continuation downwards. All the remarks made above in reference to uterine ruptures hold good for these *utero-vaginal* injuries, which of course may run vertically or obliquely, but are almost exclusively situated at the sides.

Purely vaginal tears are not common; M'Clintock out of 108 tears, that occurred in the Dublin Rotunda, only found 35 that principally affected the vagina. They almost always run *transversely* at the posterior or anterior wall to a greater or less extent; indeed the fundus may be separated from the uterus in a circular manner (*kolporrhoeis* of Hugenberger¹). The etiological factors are similar to those accompanying rupture of the lower uterine segment or cervix; the relative frequency in primipara and multipara is also similar.

When, in cases of pelvic contraction, the "pains" have succeeded in retracting the cervix over the head, while this remains fixed in (or upon) the pelvic brim, the vagina may be dragged up and stretched, until at last it splits or is torn from the uterus, under the influence of the increasing retraction of the internal os and of the expelling force; this condition was first described by Boer (*l.c.*) and Michaelis (*Das enge Becken*, p. 208). Rupture is particularly apt to occur under such circumstances, since on the one hand the expansion has diminished the resisting power of the vagina, and on the other the region that can share in the distention, has been limited in extent by the firm application of the head, while moreover the local bruising has rendered the parts more liable to tear. In these cases the uterus sometimes ascends even more than with ruptures of the cervix, indeed it may reach far into the epigastrium, the extent depending on the degree to which the vagina can be pulled up.

Occasionally however the rupture is merely the result of some contraction of the vaginal fundus by cicatricial tissue, which is broken through by the advancing fetus. The existing condition will then determine the extent of the tear; I have seen a transverse rent measuring 6 cm. (2.5 in.) in length, form on the left side, where the cicatricial tissue was most abundant.

In not a few instances, the vaginal fornix has been perforated by the blades of the forceps, by the cephalothryptor or perforator;

¹ In the 39 cases of this kind collected by Hugenberger the anterior wall was involved 16 times, the posterior 17; in 6 the vagina was more or less completely detached.

or it may be torn off by the accoucheur violently introducing his hand into the uterus, or too severely pushing up his hand or the presenting part of the fœtus, while attempting to turn. Lastly, in extremely rare cases the vagina is perforated by a uterus retroflexus being forced far down, or by a tumour (cf. §§ 289 and 608).

§ 740. The *signs* associated with rupture of the vagina, resemble, although they are frequently far less distinct than, those of rupture of the uterus. The differential diagnosis can therefore only be made with confidence, when the injury can actually be felt, although during labour this is usually prevented by the presenting part of the child covering the seat of injury. The tears, that involve the upper part of the vagina, not uncommonly begin quietly, and are gradually enlarged by means of the subsequent uterine contractions, the latter being less likely to subside or disappear than they are with uterine ruptures, for the simple reason that the functional organ is not affected. Moreover inasmuch as the tear which has occurred, cannot contract and thereby become narrowed, it more often happens that the fœtus escapes into the abdominal cavity and that the intestine and omentum prolapse. On the other hand spontaneous delivery can occur more easily in spite of the rupture, provided that the fixed part remains *in situ*, and that the rupture has not occurred below it. Hæmorrhage is rarely copious, inasmuch as the affected regions are but little vascular. Ante-uterine emphysema and ante-cervical or vaginal hæmatomata have been observed. The tear may be entirely subserous.

An illustration of the extent, to which the fundus vaginæ may (either suddenly or by degrees) be torn off, is recorded by Thomas Paget¹, in which the completely detached uterus with its appendages descended far into the vagina, and in which at the post-mortem the external os could be palpated, by introducing a hand into the abdominal cavity; there is another by Braxton Hicks², in which a medical man, who had just extracted the child by the forceps, and was attempting to remove the placenta by pulling at the umbilical cord, dragged to light the entire non-inverted uterus, the whole of whose vaginal attachments had been severed. To this category of accidents probably also belongs the case, which forms the basis of Breslau's Disser-

¹ *British Med. Journal*, March 27, 1869.

² *Lancet*, Jan. 23, 1869.

tation "De totius uteri extirpatione"; also those published by Schwarz¹ and Nieprasch².

The *prognosis* of tears through the upper portion of the vagina, as may be easily understood, is not much better than that of uterine tears. True, Danyau records 4 recoveries out of 17 cases and M'Clintock 13 out of 51, but the seat and extent of the injuries were not taken into consideration; the cases where the vagina was really torn off, yield less favourable results. Almost all the women in whom the uterus has been torn out, have progressed remarkably favourably.

§ 741. As regards immediate and after *treatment*, nearly everything holds good that has been said of uterine ruptures, indeed the most speedy delivery possible is even more urgently demanded in these cases, since, where the child has not yet escaped into the abdominal cavity, such escape may possibly be prevented. The best mode of delivery depends on the relation of the fetus to the pelvis and to the tear; but, owing to the low situation of the latter, it will be more often possible to extract through the parturient canal, than it is with uterine ruptures. Styptic applications to the wound are undesirable, owing to the risk of corroding the peritoneum, while cold irrigations involve a risk of the water penetrating the abdominal cavity; where there is copious hæmorrhage, an ice bag may be applied externally, and the rectum irrigated with cold injections. The advice which was given by M'Clintock (*l. c.*) and had been previously by Hohl³, namely that the edges of the wound should be united by sutures, will rarely be found practicable (although it is a very reasonable suggestion), viz. only where the tear is not too extensive, and can easily be brought into view, where the edges of the wound are accessible and the upper one, which lies close to the uterus, can be reached with the needles, and where assistance is readily procurable. The closure must be done early, if it is to do any good.

(2) *Lacerations of the Middle Portion of the Vagina.*

§ 742. It is rare for lacerations in the middle portion of the vagina to be deep, or to involve the bladder or rectum; as a

¹ *Archiv f. Gynækologie*, xv., p. 107.

² *Berliner Klin. Wochenschrift*, 1880, p. 388.

³ *Cf. Lehrbuch der Geburtshülfe*, 2nd ed., 1862, p. 635.

rule they are slight, and merely affect the mucous membrane and its subjacent tissue. The *deep ones* scarcely ever occur spontaneously, except where the vagina is but little dilatable as a result of congenital or cicatricial stenosis, the unavoidable rupture of which is prolonged through the neighbouring tissues; usually they are produced by sharp instruments, splinters of bone, by the forceps &c. The last instrument only causes such perforating injuries, when it includes and pinches up the vaginal folds, and then tears them off; I know of an instance in which a large flap of the vesico-vaginal wall was detached in this way.

Superficial tears are due to the same causes as deep ones, but they are much commoner, as will be readily intelligible. As a rule they are produced by excessive stretching of the vagina, or by the sharp edges of the forceps during the extraction of the fetus, where pendulum or rotatory movements are made without sufficient care; or else they may arise from the constant friction and pressure that are exerted by the head, when this remains for a long time in the same position. These tears almost always run longitudinally.

The first sign of each of these various kinds of injury is, apart from the direct symptoms associated with the perforation of the neighbouring organs, hæmorrhage. This however does not show itself, as long as the head remains in the pelvis; it begins after delivery, and only then for the most part are the tears detected. Indeed occasionally the bleeding does not start, until the second or third day *post-partum*. The hæmorrhage is rarely copious, and may generally be checked by irrigating with ice-water, or with a very dilute solution of perchloride of iron. It will scarcely be possible to pick up the actual bleeding vessel, where the tissues are so misshapen, swollen and covered with blood; where therefore the hæmorrhage is very free, the best plan is to plug the point from which it comes, with cotton wool soaked in carbolic acid or a solution of perchloride of iron, a proceeding which will not be found difficult. Any tears that are easy of access and have smooth edges, should be at once sewn up.

During the puerperal state the minor tears heal up without symptoms, and without leaving any evil results: they close by granulating. Deeper ones may give rise to ulcerative colpitia,

severe traumatic fever, peri-vaginal and parametric inflammation and collections of pus, as well as to rectal and vesical fistule. Moreover they not infrequently leave tight cicatricial stenoses and complete atresia behind, as is proved by the frequency with which urinary fistule are associated with stenoses. The treatment of endocolpitis consists mainly in diligently irrigating and disinfecting the vagina with tepid 2 p. c. carbolic lotions, while on the other hand the secondary effects of the injury must be kept in view. There are no means of preventing a stenosis which is in course of formation, although it might be worth while to try to prevent complete atresia, by the early introduction of a metallic tube into the granulating and gradually contracting region.

In the last place I may mention that where we have to do with a sudden vaginal rupture, which perforates the bladder or rectum, and the edges of which have therefore not begun to slough, the best course is at once to close the opening by sutures. The middle and lower portions of the vagina are so accessible that this cannot be difficult, while on the other hand the conditions are more favourable now than at any other time to sound and complete union. Sometimes again tears, which cannot be sewn up on account of their high position, heal spontaneously.

(3) Vaginal Fistule.

§ 743. Amongst the worst results of injuries to the vagina are *vaginal fistule*. They either arise directly through rupture of the vesico- or of the recto-vaginal wall, or indirectly through sloughing brought on by pressure, or through ulceration which has ended in perforation.

In regard to the *recto-vaginal wall* the first mode of origin is almost universal. The large majority of all the fistule that are formed here, are either produced by instruments or splinters of bone being forced through, or they are the remains of vagino-perineal tears which have only partially healed. The rarity with which this injury is caused by the tissues being rubbed through, is explicable by the absence of any hard, sharp-edged substratum, against which the vaginal wall could be squeezed during labour.

The very opposite is true of the *vesico-vaginal wall*. Immediate perforation is here a rare event, while on the other hand it

not uncommonly happens that this wall is squeezed for a long period against a sharp, bony substratum. In the case of the upper portion of the vagina and the portio vaginalis, such substratum consists of the upper edge of the anterior pelvic wall and of the upper division of its posterior surface; in the case of the lower portion by the inferior border of the symphysis. It is true that at this latter point the pressure never lasts very long, and accordingly fistulæ are usually only found here after artificial, more particularly, forceps extractions. The forceps does not directly cause the injury, but acts by forcing the advancing part of the fœtus too strongly against the portions of the vagina which are lying against the lower border of the symphysis, and bruising them to such an extent that they subsequently slough. Or else it causes some laceration, from which ulceration afterwards spreads to the bladder or urethra. Hence in the case of *normal pelvis* fistulæ are mainly confined to the *lower* third of the vagina.

The *upper* portion of the vagina and the portio vaginalis, on the other hand, mainly suffer where prolonged pressure has been exerted on one spot, and this explains why fistulæ of these regions are almost only found after delivery through a *contracted* pelvis. It would however be a mistake to attribute the trouble to the artificial delivery, which has been necessitated by the contraction; I am confident that such is but rarely the true explanation; the mischief (*i.e.* the mortification due to the pressure) was practically a *fait accompli*, before the aid was given. This was shown by the 12 cases of fistulæ which occurred in the in- and out-patient Maternity, which is under my care¹. In 10 of these cases the labour had been completed artificially (7 times by craniotomy, once by version followed by craniotomy, twice by forceps); only twice did it terminate spontaneously. But in every instance delivery only occurred after a prolonged delay, varying from 25—90 hours, the average duration (taking the 12 together) amounting to 48 hours. The correctness of this view is confirmed by the fact that in the majority of cases the incontinence of urine came on very rapidly; since sloughing tissues are rapidly discharged, whereas communications with the bladder resulting from superficial tears and secondary ulceration (endocolpitis), take much longer to develop. Nor would it as a rule be

¹ Cf. Hempel, *Archiv f. Gynækologie*, x., p. 167.

fair to blame the medical attendant for this prolonged delay, since, in cases of contracted pelvis, such delay is generally due to the slow dilatation and retraction of the cervix, and since the rupture of the membranes, simultaneously with which the undue pressure so frequently begins to act, almost invariably takes place prematurely. Again, it is quite possible that far more fistulæ are formed than we are called upon to treat, since a certain number of small ones probably close spontaneously during the puerperal state; this is especially true of cervical fistulæ, as has been rightly pointed out by A. Martin. Small orifices close spontaneously, during the involution of the organ.

The pressure referred to above, seems especially apt to produce sloughing and to lead to the formation of fistulæ affecting the portio vaginalis, in the case of flat pelvis (more than in the other kinds of contraction), both the common flat and the generally contracted flat variety. And this is just what we should expect, since the pressure is more likely in these than in the other kinds to be applied over circumscribed areas. Fistulæ more rarely accompany uniformly distributed contraction, the latter generally giving rise to large gaps, involving the vagina alone. A steep anterior pelvic wall, which for a long time detains the side of the skull, which is lying against it, predisposes to the above injury; so also does, and for the same reason, an unfavourable position of the head. The resistance of the skull too has some influence, and in this connection it is probably more than a mere coincidence that every one of the 12 cases referred to above, related to the birth of boys. I have not been able to discover from the literature of the subject what light a larger collection of cases of fistulæ would throw on the question.

If in the course of a labour the anterior lip of the uterus and the vaginal fundus become greatly swollen, or if the urine is bloody and turbid, the possible development of a fistula should always be thought of.

c. Tears at the Vaginal Introitus and Vestibule.

§ 744. Tears at the vaginal introitus must be distinguished from those of the perinæum, although they sometimes constitute the first stage of the latter. They are extremely common; indeed in primiparæ they are scarcely ever absent, as Schröder (*Schwangerschaft, Geburt und Wochenbett*, p. 165) has shown,

and in multiparæ also superficial tears in the mucous membrane are common enough. The fact that they may become centres of infection as well as be the source of copious hæmorrhage, shows that it is never wise, even in slight cases, to regard them as unimportant.

When, in a primipara, the descending head begins to push down the perinæum, it is at first held back by the narrow vaginal orifice, through which it tries to pass by assuming the form of a wedge; at the same time it causes the whole circumference of the orifice to bulge, and the edges of the latter to become extremely tense. The posterior margin then usually gives way in the middle line, and from here the rent is continued up through the posterior vaginal wall, and down into the fossa navicularis. The area of the wound, when its edges are drawn apart, is of irregular quadrangular shape, presenting an upper, a lower and two lateral angles, formed by the divergent edges of the tear through the posterior wall of the introitus. If the parts lie in contact after delivery, the tear appears smaller and deeper.

Occasionally a small flap of mucous membrane is torn from its attachments, or the tear may extend laterally on to the nymphæ and into the neighbourhood of the urethra, giving rise to loose tags of mucous membrane; as a rule these unilateral injuries are found on the left side, along which, as we know, the occiput most often rotates into view. In multiparæ on the other hand, we often merely find cracks and slight abrasions behind the fossa navicularis and at the vestibule.

All these injuries are beyond the range of prophylaxis, inasmuch as they are caused by the large size of the advancing part of the fetus, and by an insufficient distensibility of the passage. Nor will it often be practicable to increase the size of the orifice by an incision, since the distending head does not admit of any good view into the vagina, and the injury is no worse than the incision. But after delivery care should be taken that the wounds are thoroughly disinfected.

§ 745. *Injuries of the vaginal vestibule and particularly of the parts below the clitoris, and at the side of the urethral orifice are of greater importance than those just mentioned. They always give rise to some hæmorrhage, although in the great majority of cases this is not profuse, since the tears are usually quite superficial and the bleeding soon ceases spontaneously, so that the*

tear passes out of observation. For the most part too the hæmorrhage is looked upon as uterine, its true source being overlooked; indeed this is doubtless the explanation of the various statements we find in regard to the frequency of the injury. We should hear a very different story, if the external generative organs were inspected after every confinement, an easy and simple matter while the woman is lying on her side.

The tears run sometimes parallel to the clitoris, sometimes downwards and outwards from it, sometimes outwards and upwards from the vaginal orifice; they may either lie in immediate proximity to the urethral aperture, or at some distance from it. As a rule they are unilateral, although both sides may be involved. Now and again a perineal rupture co-exists with a vaginal. In many cases merely a varicose vein of the vestibule is injured. The hæmorrhage may either begin during the exit of the child, or immediately after it; when severe, it usually only becomes so after delivery. Sometimes the bleeding only becomes profuse, if after delivery the external parts are exposed and thereby stretched; when this happens, the flow of blood must previously have been prevented by the close contact of the tissues after labour. The hæmorrhage may be venous or arterial in character; as a rule it is both. The blood may then either ooze, as from a soaked sponge, or come in spurts; even in the latter case the origin is not necessarily purely arterial, since veins too may spurt, where cavernous tissue is tense and full. In occasional instances the erectile tissue of the bulbs of the vestibule, which unite below the clitoris, has been affected; but this does not happen frequently, owing to their relatively deep situation.

The hæmorrhage however may be very copious, even where the injury is superficial. This is to be explained by the anatomical conformation of the parts, their numerous vessels¹, their enlargement which is associated with pregnancy, and by the tense and engorged condition which the pressure of the head [through impeding the return of the blood] has produced. When the source of the bleeding is not discovered in time, extreme anæmia

¹ Even in the non-gravid woman these sometimes bleed freely. Cf. Klaproth (*l.c.*), who was the first in recent years again to draw attention to these injuries; also Simpson, Thomas (*American J. Obstetrics*, x., p. 287), Kaltenbach (*Zeitschrift f. Geb. und Gynäkologie*, iv., p. 293) and Becknitz (*Centralblatt f. Gyn.*, 1878, p. 23).

(*cf.* Klaproth, *l. c.*) may result, indeed the woman may actually bleed to death, as in the two cases referred to by Muller¹ (*l. c.*) and in the one briefly described by Poppel². The actual injury arises from narrowness of the vaginal orifice, from the head being too severely forced against the anterior edge of the vulva, or being prematurely elevated in cases of instrumental delivery, and is therefore almost only seen in primiparae. These remarks moreover indicate the best way to prevent the accident; early lateral incisions into the rima pubis at times afford considerable relief.

If the practitioner makes it a rule after every confinement (especially in primiparae) to inspect the vulva and vaginal orifice, while the woman lies on her side, or at any rate to do this, whenever hæmorrhage occurs, while the uterus is well contracted, these tears will always be detected, and an injurious loss of blood easily averted.

It is not difficult to arrest the hæmorrhage. In the first place one or two fingers should be kept pressed on the bleeding spot, until the placenta, if not yet expelled, is removed, and the parts have been cleansed. The hæmorrhage will frequently subside, as soon as cold water is applied and pressure made with a pad of cotton wool or lint. If the edges of the tear are small and smooth, they should be brought together with a suture, or else they may be seized with toothed or pressure forceps, the latter being left *in situ* for an hour or two. There is not likely to be much more bleeding when these are removed; occasionally one or two *serre-fines* suffice. If the edges of the wound are irregular and much bruised, bits of cotton wool, soaked in perchloride of iron, should be pressed upon them, and kept in place by adduction of the legs; if necessary, the bleeding point may first be included in a suture. It is quite unnecessary to tie the arteries separately, nor would it be easy to do so, with such friable and non-retractile tissues.

d. Ruptures of the Perineum.

§ 746. We have already (§§ 148, 194) described the best mode of ensuring the safety of the perineum during the exit of

¹ The fatal case, due to hæmorrhage from the vestibule during pregnancy, which the same author has met with, has been mentioned in § 402. A similar instance is related by Hecker (*Beobachtungen und Untersuchungen*, 1881, p. 168).

² (*J. Monatsschrift f. Geburtskunde und Frauenkrankheiten*, xxviii., p. 298).

the child. In most primiparæ however the fourchette splits or even tears off, although it is not very uncommon to find a person who has borne children, and in whom the posterior vulvar commissure is still intact; this however is very rare in multiparæ. Such tears of the fourchette must therefore not be included under ruptures of the perinæum, especially as they are unimportant. But even true perinæal tears, which extend beyond the fourchette (towards both the cutaneous and the mucous surfaces) and involve the musculature, are common enough. It is impossible accurately to state their frequency, since obstetricians differ greatly in their view as to what constitutes a perinæal rupture; I may mention however that in the Maternity here tears of over 2.5 cm. (1 in.) in length, measured from the fourchette, occurred in 102 out of 3,000 deliveries = 3.5 p. c.

The injury arises partly from the perinæum being unduly stretched by the advancing part of the fœtus, partly from the latter forcing itself too much against the posterior portion of the perinæum, over which it ought properly to glide forwards; partly, and not uncommonly, from some disproportion between the extensibility of the perinæum or pelvic floor, and the size of the rima pudendi on one side, and the bulk of the emerging part of the fœtus on the other¹. Every case of perinæal rupture is due to the operation of one of these factors, sometimes to the simultaneous action of several. Although therefore an intelligent management of labour is of immense value, under certain conditions it may evidently be impossible to preserve the perinæum entire.

§ 747. The tears are either *vulvo-perinæal* or *central*, the latter however being rare.

Vulvo-perinæal tears generally arise from excessive stretching of the anterior edge of the perinæum, and from this point are prolonged backwards to a greater or less distance. They may either merely affect the skin and the immediately subjacent layers, when the deep muscular layer and the perinæal portion

¹ On frequent occasions I have seen the perinæum give way not at the time of, but before, the exit of the fœtus, viz. just as I was introducing my hand for the purpose of performing some obstetrical operation (the kind of operation varied greatly and included version, craniotomy, liberation of the arms). This happened most often in primiparæ and after I had repeatedly introduced my hand. The same occurrence is recorded by Goodell (*American J. Obstetrics*, xi., p. 171).

of the posterior vaginal wall escape (*superficial tears*); or else the whole pelvic floor, including its vaginal lining, is torn through (*deep tears*). On the other hand the rupture not uncommonly starts *from the inside*, i.e. from the vaginal aspect, and runs in a vertical, or at first in a transverse, direction, and this variety is especially common when the part of the fetus which is about to make its exit, presses in a wrong direction, the pelvic floor then being broken through from its vaginal surface. This occurrence may either take place suddenly or else gradually; indeed the posterior vaginal wall may tear low down, and the superficial skin remain intact until after the exit of the head, when, having become yielding and fragile, it at last gives way

during the passage of the shoulders. Another sequence of events is also said to occur: the vaginal wall and muscularis with the fascia give way and stretch, but not the skin; the latter bursts afterwards in the middle, its tear extends forwards and only then communicates with the vagina. This form must be very rare.

The extent of the ruptures as regards depth (i.e. from skin to vagina) must be kept distinct from that as regards length (from the anterior edge of the perineum to the anus); the latter varies considerably. In the first

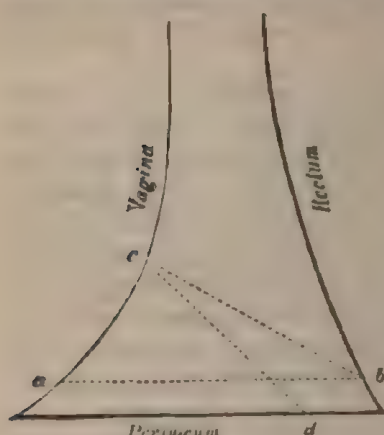


Fig. 118.

- ad* is a superficial tear of the first degree;
ab " " at the boundary between the second and third degrees;
cd is a deep tear of the first, and
cb " " third degree.

degree (fig. 118) the perineum is torn for 2—3 cm. (.8—1.2 in.), the anus and a portion of perineum in front of it remaining uninjured. In the *second* degree, the rupture passes through the whole perineum and involves the skin also at the anterior edge of the anus, but the sphincter is still intact. Lastly in the *third* degree, the sphincter is torn, and the recto-vaginal septum is broken through for a distance of several centimetres above the anus. The adjoining diagram will make these differences clear.

In the majority of cases the tear passes directly backwards in the middle line (rarely on one side of it), and its edges are irregular. Sometimes it branches, and, without involving the anus, runs round it like a ring at a variable distance. In the vagina the tear is median below, but higher up it usually deviates to one side, so as to avoid the thick and firm tissue of the *columna rugarum posterior*.

§ 748. *Central ruptures* (i.e. those in which the perineum is bored through) are only met with under exceptional circumstances, namely when the descending head presses with all its force upon the posterior portion of the perineum, instead of moving forwards into the rima. This variety of rupture is favoured by great breadth of the perineum, if associated with narrowness of the vulvar orifice.

With these conditions, the rupture through the pelvic floor begins at the perineal portion of the posterior vaginal wall, the anterior perineal and the anal regions remaining intact; the front part of the latter may however be involved at the same time. Unless the unfavourable direction, in which the head advances, is corrected, unless the head is conducted forwards in good time, it and indeed the whole child may pass through the tear¹.

In other, and equally rare, cases the vaginal wall may tear through at the point where its rectal passes into its perineal division; such a rupture may merely involve the recto-vaginal wall, the sphincter sometimes, but not always, escaping. *The perineum remains intact.*

§ 749. Rupture of the perineum does not at first give rise to any very marked symptoms. The hæmorrhage is usually very slight; only where the rupture is deep and passes into the rectum, does an artery sometimes spurt. The hæmorrhage usually ceases on the application of cold. Pain and an intense sense of soreness are probably always present; but the severity is by no means in direct proportion to the importance of the injury. During the puerperal state there is some, but only a moderate degree of, traumatic fever, although with extensive injury and after septic infection there may be some *sloughing of the edges* and surrounding tissues. Observations by Dr.

¹ Instances of this are recorded by Sir J. Simpson ("Works", i., 1871, p. 593); Blasius (Württemberg. Med. Correspondenz-Blatt, 19, 1847); Grenser (Monatsschrift f. Geburt., viii., p. 358) and Bigelow (Centralblatt f. Gyn., 1878, p. 287).

Matthews Duncan¹ show that even a superficial tear may in this way lead to extensive destruction of tissue.

Spontaneous recovery (*i.e.* complete restoration of the perinæum) is now and again seen, when the tear is short and superficial. In exceptional cases also with large tears; for instance when the edges are regular, the skin may again grow firm and the subcutaneous cellular tissue tense. Even then however recovery is scarcely perfect, since the rima is invariably somewhat elongated, while the labia majora are drawn out of place by the cicatrising edges of the wound, and come to occupy the situation of the tear. A close and constant adduction of the woman's thighs, during the first days after the injury, undoubtedly assists in approximating the edges of the tear to one another. But on the other hand the adduction necessitates the simultaneous closure of the vaginal orifice; the lochia are thus compelled to pass over the lips of the wound, and this will cause them to suppurate. Deep ruptures therefore, where the musculature has been divided, heal, if left to themselves, by gradually skinning over and cicatrizing. As the granulating surfaces are drawn together, the vaginal mucous membrane is drawn downwards behind and at the side, and the edges of skin become inverted and fringed with mucous membrane; the labia are elongated backwards. Hence the vulva gapes, and the previous pelvic floor is lost, this leading to a want of support for the vagina and secondarily for the uterus.

Now it is true that this condition is not always followed by prolapse of the vagina and uterus; still such a result is very likely to develop by degrees, and the door is open for the internal generative organs to be irritated in various ways, and for the anterior rectal wall to be stretched. Moreover as regards sexual relations, the woman is no longer what she was, even if the statement of Dieffenbach's that "a woman with a ruptured perinæum feels as much afflicted and degraded, as if she had been spayed", is only true in exceptional cases.

If the sphincter and rectum have also been torn, the latter with the vagina forms a single cavity with parallel side walls; a cloaca results and causes incontinence of feces and flatus. The labia however are not so much drawn backwards in this condition, since, owing to rupture of the constrictor muscle,

¹ Cf. *Obstetrical Journal of Great Britain*, May, 1876, p. 191.

there is no firm *point d'appui*. On the other hand the mucous membrane of the rectum is dragged into view.

§ 750. The preservation of the perineum is so important a matter for a woman, that her medical attendant must *make every effort to prevent its rupture*. The means of doing this have been described in § 194, so that here I may content myself with adding that where the perineum appears to be endangered through insufficient extension of the head, or where the latter is advancing in a very unfavourable direction, the forceps alone is able to effect the extension, and thus to save the perineum. That instrument is therefore almost always required, where a central rupture has occurred, or appears imminent.

An existing rupture should be immediately sewn up, i.e. after removal of the after-birth, the expulsion of which might otherwise stretch the united wound. There can no longer be any diversity of opinion as regards the advisability, indeed necessity, of *immediately* uniting the edges of the tear; the conditions will never again be so favourable to primary union as they are now, while the fear lest the processes of involution might thereby be disturbed, or that the lochia might pass in, is a fallacy, which experience has long disproved. Even if permanent union does not take place, no harm will have been done by immediate suture. Especially should tears which involve the sphincter and perineum, be sewn up at once; they are more likely to heal now than at any future time. Even where several, indeed 24, hours have elapsed since delivery, sutures may still be inserted, but the superficial layer of tissue over the injured areas should then be first of all removed by scissors, since it will generally have dried and be covered with exudation. *Every tear*, even the smallest, *should be sewn up*, partly because the proceeding is simple and but little painful, partly because spontaneous union is almost always imperfect, while on the other hand the perineum can never form a proper pelvic floor, unless it regains its original form. The various modes of union other than by sutures (*e.g.* by serrefines, the application of collodium) have no advantage over the first-mentioned method. They are much less reliable and convenient, and are only suited for very superficial tears; in a word they are obsolete.

Before proceeding to insert the sutures, the practitioner should carefully inspect the injury, so as to get a clear idea of its extent.

This can be easily done, if the woman lies on her side. If a deep rent is thus detected, the lying-in woman should next be placed on her back with raised pelvis, preferably in the lithotomy position; indeed this is the only satisfactory way of closing the wound. An assistant now holds the edges of the vulva apart and moderately stretched, while the operator makes them even, by removing with the scissors any still adherent shreds of tissue. If large vessels continue to bleed, they should be tied (with cat-gut), and the whole field irrigated with cold, carbolised water. Moderately long and curved needles do best for this operation, and are to be held with the needle-holder. Even where the tear is superficial, it is well to include a good piece of the edges of the wound, since the muscular portion of the perinæum always retracts to the side in ruptures, and will not be reached, if only

a narrow lip of the edges of the wound is taken in. Moreover if only the latter are united, the chances of recovery are much less favourable, and even with the best results we should merely get a thin and feeble covering.

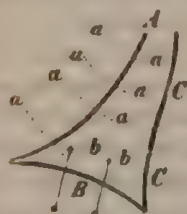


Fig. 119.

- A. posterior vaginal wall,
B. perinæum:
C. Anterior wall of the rectum:
a. vaginal. b. perineal stitches.

If the tear is a deeper one, the mucous membrane of the vagina must be included in the suture. This may be done from the perineal aspect, by carrying the needle far round the wound, and so deeply that it comes out at the edge of the vaginal wound. *It is better however to unite the vaginal and the perineal tears separately, the former first.* If this is done, the vaginal mucous membrane will not be drawn towards the perinæum, and, when union has occurred, the parts will regain their natural relations. After inserting the vaginal sutures, the edges of the perineal tear will of their own accord apply themselves to one another; the wound will now appear less deep, and its permanent closure must then be completed by 2—3 deep, and a sufficient number of superficial, stitches. Additional sutures are generally required for the vaginal tear or tears, since the edges must be brought very accurately together. When union is complete, the two lines of sutures will lie in two planes at right angles to one another, and

passing each into the other at the so to speak fourchette region of the perineum (fig. 119). If the rectum is also torn, it, together with its anal portion, must also be separately sewn up, the knots being left on the mucous aspect; a "three-plane suture" (Dieffenbach) will be produced in this way, whose points of reflection lie in contact with each other. Catgut or fine carbolised silk does well for sewing up the vagina or the rectum; wire may be used for the perineum, but the material is unimportant.

§ 751. The *subsequent treatment* should be as simple as possible. The woman may lie in any way she likes after the operation, provided that she keeps her legs moderately adducted; for this purpose her knees may be tied loosely together. Micturition should, if possible, be spontaneous; catheterisation involves undesirable contact with the wound, and is apt to lead to vesical catarrh. For the first two days cold lotions of carbolised water may be kept applied to the wound, with a view to diminishing the pain and sense of tension. It is also a good plan gently to bathe the external generative organs morning and evening with a tepid, carbolic lotion, so as to remove any lochial or other secretions from the wound. Vaginal irrigations should not be used, except where the lochial discharge is offensive; they are apt to irritate the wound. These various precautionary measures only hold good for the first four or five days.

The *diet* should consist of such articles as are suited to the puerperal state, since defecation will in this way be postponed for some time. Even where the sphincter was not injured, the bowels should be kept from acting for 6—8 days, 10—15 drops of tincture of opium being administered every day with this object. The reason for this is that during defecation the perineal muscles are necessarily thrown into action, and this of course does not conduce to the closure of the wound. Where the rectum is torn, defecation must be delayed for a still longer period. If however a sense of straining sets in, which demands relief, an enema of oil may be administered, so as to soften the scybala; or if the constipation seems to be doing harm, the rectum may be irrigated daily.

The perineal stitches should not be removed, until the first week has elapsed. Nothing is gained by leaving them longer, since in any case they will have become loosened by the shrinking of the tissues. The vaginal sutures should be left longer

in situ, since their too early removal might injure the recent cicatrix, owing to the unavoidable stretching of the edges of the vulva. The majority are usually discharged, by the superficial parts melting away into pus; but if necessary, they may all be removed at the end of two weeks or more. If no traumatic complication has occurred, the lying-in woman may leave her bed at the usual time, or at most only a few days later.

Central ruptures should be treated by splitting the perineum down in front, and then sewing it up as in the case of an ordinary deep rupture. This is the quickest way of effecting union, and no vagino-perineal fistula will be left.

c. Rupture of the subcutaneous and submucous vessels in the vagina and external generative organs. Thrombus, hæmatoma of the vagina and vulva.

§ 752. If a vessel of the vulva, or one lying beneath the vaginal mucous membrane or in the peri-vaginal arcolar tissue, gives way, the blood, if unable to escape externally (either for want of a superficial opening, or because the existing one does not correspond with the injury to the vessel), is effused into the neighbouring loose connective tissue, which in these parts is but little confined by firm skin or fasciæ; the blood makes its way between the layers and distends them, forming an elastic tumour which may reach the size of a child's head, and which is sometimes sharply circumscribed like a cyst, but sometimes passes gradually into the surrounding tissue (*thrombus*). This form of hæmatoma is most frequently seen in the vulva¹, generally starting at the inner side of the labia majora and from there extending upwards beneath the mucosa of the vulva and vaginal orifice, while downwards it spreads out in the subcutaneous tissue between the superficial and middle fasciæ of the perineum, and as far as the gluteal region. It is rarer for the submucous and peri-vaginal connective tissue of the vagina to be primarily infiltrated; but in such cases also the blood, since it is generally effused beneath the pelvic fascia, makes its way towards the pelvic outlet and the vulva, unless that fascia is softened at some point and broken through. If on the other

¹ Barnes (*Diseases of Women*, p. 876) has also seen a hæmatoma of the clitoris and urethra.

land blood is once effused above that fascia, it is the exception for it to penetrate to the external generative organs (*i.e.* only when the fascia has been broken through in the way referred to); the hæmatoma is much more likely to lie entirely within the vagina, and the effusion may then extend between the pelvic diaphragm and the peritoneum far to one side and upwards, to the iliac fossa and kidneys, indeed even to the hypochondrium (Cazeaux), and anteriorly to the navel.

As a rule the thrombus only involves one side either of the vulva or vagina, but it is equally common on the right and left sides. A few observations of the bilateral affection are on record.

The condition is on the whole rare. Johnston and Sinclair (*Practical Midwifery*, 1858) met with it 7 times out of 13,748 cases, Hecker¹ 5 times out of 16,435 births, Dubois only 3 times in 14,000; Hugenberger on the other hand 11 times out of the same number of, *viz.* 14,000, births, Späth 4 times² out of 6,000; at Vienna during an earlier period it was observed 10 times out of 33,241 cases. Scanzoni records 15 cases that occurred in his practice, McClinton (*Memoirs on the Diseases of Women*) 25 cases. I have met with thrombus 5 times in 5,000 labours in my own practice, but of course I have seen it oftener in my out-patient department. Hence Winckel probably sets the ratio too high, when he estimates the frequency from his own and others' experience at 1 : 1,600.

Causes.

§ 753. A thrombus is occasionally formed during pregnancy, but almost invariably is so only during delivery, either just before, or soon after, the exit of the child; in one or two instances it has occurred during the first days of the puerperal state. The predisposition consists in the considerable dilatation and engorgement, during pregnancy and labour, of the vessels which supply the generative organs, which condition is especially marked in the lower portion of the genital canal, and particularly in the erectile organs, and with which an increased fragility of the vessels is frequently associated. This moreover is the reason why the extravasation is extremely rarely of arterial origin.

¹ *Cf. Dissertation by Weckbecker-Sternfeld, Munich, 1879.*

² *Cf. Wucher, Wiener Medicinische Wochenschrift, No. 52, 1878.*

Varicose veins of the vulva undoubtedly occasionally co-exist, but they cannot be brought into causal connection with the formation of hæmatomata, since they do not occur more often in conjunction with the latter than at other times; further evidence is derived from the fact that a thrombus is *relatively* more common in primiparæ, who do not often suffer from varicose veins, than in multiparæ¹. Nor indeed does an extensive development of varices seem to induce any special tendency to thrombus, for M'Clintock (*Memoirs on the Diseases of Women*, p. 273) as well as C. Braun (*Klinik d. Geburtskunde*, p. 330) and Fordyce Barker (*Puerperal Diseases*, 1874) state that in none of their patients suffering from varicose veins, have they ever seen a hæmatoma².

The laceration of the vessel may, when unconnected with external injury, be due to a sudden rise in the abdominal pressure, and this doubtless is the usual cause of hæmatomata occurring *during pregnancy*. In the case of *labour*, not only do the vessels become engorged, through the head being fixed in the pelvis, but the difficulties of delivery may directly cause the injury under discussion; the origin however is much more commonly spontaneous than due to artificial interference, indeed the published accounts rarely refer to the latter. There seems special danger of this injury, when the fœtus advances rapidly over the engorged vessels, these probably being lacerated at the moment that the lining mucous membrane and the submucous tissue are pushed over, and detached from, them by the fœtus. Indeed this explains why the injury is comparatively so common in primiparæ, in whom the connection in question is firmer and less yielding than it is in women who have already borne children.

The thrombus usually forms rapidly, and rapidly grows larger. But if the bleeding spot is pressed upon by the presenting part of the fœtus, the tumour may develop very slowly, indeed only after delivery. We may explain its origin in the puerperal state, by supposing that at first the injury merely caused a partial tear

¹ Winckel noted 12 primi- to 18 multiparæ. M'Clintock 13 to 12; so that altogether we get 25 primi- to 30 multiparæ, figures which are out of all proportion to the frequency of primiparity.

² Amongst Winckel's 50 cases of hæmatoma, varices were only observed in 6; amongst 35 collected by M'Clintock only twice, amongst 15 by Scannoni only once, while out of 11 by C. Braun, and 11 by Hugenberger, they were never observed. Thus varices were only present 9 times amongst 125 hæmatomata, so that the association is probably purely an accidental one.

and mortification, which afterwards resulted in sloughing of the wall and perforation of the vessel; or else that the opening in the vessel was very small, and only allowed the blood to pass out slowly.

In a few cases the infiltration of the cellular tissue is accompanied by free external hæmorrhage; but if so, a superficial lesion must also be present. Indeed the latter is not uncommon; and if in spite of it the external hæmorrhage is frequently absent, or if a thrombus forms, this must be due to the injured tissues being displaced one over the other. The same kind of displacement has been referred to above, as the chief reason why the deeper vessels became torn.

Symptoms and Progress.

§ 754. The formation of a thrombus is almost always accompanied by a severe pricking or shooting pain in the affected region, which may also radiate to the thighs and sacrum. This pain is caused by the tension and stretching of the infiltrated tissues, and is increased by every kind of movement. If the extravasation is abundant, the symptoms of anæmia will soon be superadded to those just mentioned. The superficial skin moreover may give way, or, if the extravasation precedes the exit of the child, be burst by the passage of the latter, when the collected fluid is discharged outwards; fresh blood is then effused into the cavity, and under such circumstances the woman may bleed to death¹. The issue however is rarely so bad as this. Either at the pudendum or within the vagina, a tense tumour, varying in extent with the amount of infiltration, and covered with a bluish, translucent integument, is found; where the effusion is fluid and mainly collected into one large cavity, there will be fluctuation. The swelling will feel soft, if the effusion is very widely distributed; firm, if it contains much coagulated blood.

Where there is only a small collection of blood, it will not give much trouble, and may be entirely absorbed. But when the quantity is considerable, the pressure symptoms in the pelvis persist with a varying degree of intensity, those relating to the bladder and rectum being especially troublesome; the vaginal canal too may be entirely blocked, so as to prevent the passage

¹ The case published by Rosow (*Allgemeine Medicinische Centralzeitung*, No. 96, 1878) is a good illustration.

of the child during labour, and that of the lochia during the puerperal state. As a rule such an accumulation opens outward within a few days, when a copious and possibly perilous hæmorrhage may again supervene; but, generally speaking, the cavity, when emptied, collapses and suppurates, and this will gradually lead to its closure, and to recovery. Occasionally the pus travels and leads to fistulous passages, which may extend far up into the pelvis, and burrow into its organs in various directions, and in this way still prove very dangerous. Under such unfavourable circumstances, *e.g.* where there is extensive destruction of the tissues, or where the skin has been extensively detached and has sloughed owing to pressure, but especially under the influence of external infection, the collected blood may decompose, and cause death by septicæmia.

§ 755. The *prognosis* may therefore be described as favourable with small effusions, but is always doubtful with large ones. It is scarcely as bad however as would appear from Deneux's statistics (22 fatal cases out of 62), and from those subsequently collected by Blott (5 fatal cases out of 19), or from the experience of Hugenberger (out of whose 11 patients 4 perished). For Scanzoni only lost 1 out of his 15 cases, and she died from puerperal fever; Fordyce Barker out of 13 hospital patients only lost 2, and both from puerperal infection, while every one of his 9 private patients recovered. Still even Winckel mentions 6 deaths out of 47 cases in which he was acquainted with the result, and this mortality of over 12 p. c. must be regarded as approximately true, as far as our present information goes. Although therefore we may confidently expect that with rational treatment and especially with strict antiseptic precautions, the death rate will in the future be lowered, the mortality is high enough to justify our speaking of hæmatomata as a severe and dangerous accident, especially as, even in the cases that terminate favourably, convalescence is usually a very slow process.

I need not say any more as regards *diagnosis*, after the above description of the local and general symptoms. It can never be difficult; at most might there be some risk of overlooking an intra-vaginal hæmatoma, which does not protrude externally. Such an error however could only occur through want of attention and investigation, and these are invariably called for by the never failing general symptoms.

Treatment.

§ 756. The totally unexpected formation of hæmatomata, and the unimportance, as regards ætiology, of existing varices of the vagina and vulva, render futile any attempts at prophylaxis.

But as soon as a thrombus is detected, the accoucheur should seek to check its further increase, by applying cold compresses and by manual compression. The fœtus, if still unborn, must be rapidly extracted. Where the hæmatoma prevents this, or is in danger of being bruised during the process, it must first of all be opened with the bistoury. If rupture has already occurred and bleeding is free, there is still more reason for delivering the child rapidly. Indeed extraction is then our only resource, since the hæmorrhage (both the free and the oozing) can only be expected to cease, when, by the removal of the fœtus, the pressure which causes the engorgement, is got rid of.

If after delivery the accoucheur detects an open thrombus (whether rupture has been artificial or spontaneous), he should immediately apply pressure to its orifice with one or more fingers, and keep it up, until the free hæmorrhage ceases. If the latter proves obstinate, the finger may be replaced by a tampon, soaked in perchloride of iron, and firmly pressed into, and on, the open wound; cold applications may be placed over the tampon. If the opening lies within the vagina, the latter may be plugged with an india-rubber bag, filled with the coldest water procurable. It is not a good plan to enlarge the opening, to clear the cavity of its contained blood, and then to compress it, on account of the risk of secondary hæmorrhage. Nor is it well to plug the cavity with astringent or disinfecting pads of cotton wool or lint, since, even if these check the hæmorrhage, they necessarily lead to free suppuration of the cavity. Such a course should only be adopted, where the hæmorrhage is so copious as to threaten the life of the woman, and cannot be checked in any other way. In most cases the milder plan recommended above will suffice; and the further treatment, apart from suitable general management, should consist of the persevering application of cold for the first days, *i.e.* be purely expectant. The best treatment to be adopted, where suppuration has begun, will be given below.

When, on the other hand, a closed hæmatoma is found after

entirely normal pelvis and easy labour. It probably happens more frequently than is generally supposed, or than might be gathered from the number of instances published, as Ulsander first pointed out. Nevertheless I cannot regard it as so common as Ahlfeld (*l. c. sub Literature*), to whom we owe the most complete work on this subject, supposes. Even if we grant that plenty of cases remain unpublished and are still oftener unrecognized, still it is going too far to regard almost every case of lameness or paralysis of the lower limbs, which follows parturition, as mainly due to an incapacity for locomotion consequent upon splitting of the symphysis. My practice has by no means been a limited one, yet I have only definitely found this rupture in two cases of labour with contracted pelvis in hospital practice; while only three out of the numerous cases of "paralysis of the limbs", which I have seen in consultation, could be attributed to the injury in question.

Rupture almost always takes place at the symphysis, since the pubic bones are more violently forced apart during labour than are the other bones of the pelvis. It is combined with a strain or separation of one or other sacro-iliac articulation, since the rigid pelvic ring can only be opened up and altered in shape at least two points of its circumference are loosened. The symphysis and the right sacro-iliac synchondrosis are most often torn next the symphysis and the left, then all three; most rarely all are the two posterior articulations alone affected².

The separation of the articular surfaces may be complete or partial. The former occurs more often at the symphysis than at the two other joints; the articular surfaces of the latter are usually only separated along their anterior border, remaining in contact behind. The splitting of the symphysis may either take place in the middle line, or the cartilage may be torn from the bone on one side; the former occurrence is mainly seen, where the symphysis is of delicate construction and the synovial fluid very abundant; the latter, where the connection is unusually firm, a condition which is most often observed in rachitic pelves. While

(*cf. Neue Zeitschrift f. Geburtskunde*, Vol. ii.

Matthews Duncan (*Researches in Obstetrics*, p. 399) relates a case in which the lumbo-sacral articulation was injured, and a lamina separated from the upper surface of the first sacral vertebra; to this lamina the intervertebral cartilage was adherent. The pelvis was uniformly contracted, and labour had been terminated by craniotomy after a trial with the forceps.

the symphysis is but little injured, its articular capsule may be unaffected, but in the case of the ilio-sacral articulation the capsule always suffers. The ligaments too are necessarily damaged; they are either entirely torn asunder, or else only individual bands of fibres remain uninjured. Where there is complete rupture, the other parts round the joint are always more or less involved; in front, the vagina, the urinary passages and the intervening cellular tissue¹; behind, usually only the contiguous connective tissue.

§ 759. A *predisposition* to rupture sometimes exists even before delivery, in the form of inflammation of the joint, or at least of a relaxed condition of its system of ligaments, accompanied by the accumulation of a large quantity of fluid in the cavity. Under such circumstances rupture might occur with a normal pelvis and during spontaneous delivery, indeed in quite an easy labour; Ahlfeld met with a case, where the pelvis was ruptured, although the fœtus was expelled without even the bag of membranes bursting. At other times the *cause* lies in some disproportion between the head and the pelvis, for instance where the head (if very hard) develops its wedgelike action in a high degree, or where undue force is expended during its expulsion or extraction; rupture of the joint is therefore often to be looked upon as a result of want of skill.

In regard to the several kinds of pelvis, the *osteo-malacic* is most liable to the accident, partly owing to the connection between the articular cartilage and bone being softened by the disease, partly in virtue of its shape. Rupture however is commonest in *generally contracted pelvis*; transverse narrowing being of course present in both these varieties. In the *rachitic pelvis*, if great force is brought to bear mainly on the symphysis, a separation may result, but this never happens with the spontaneous pressure of labour; for in these pelvis the latter acts mainly in the direction of the sagittal diameter, i.e. in a direction which is unfavourable for rupturing either the symphysis or the posterior synchondroses. And since too in the rachitic pelvis, the symphysis is as a rule stronger and more ossified than in the other forms, it is obvious that only a violent extraction can effect its

¹ In the case which has been published by Adams (*Boston Med. and Surgical Journal*, July, 1876), since the appearance of Ahlfeld's paper, the vestibule and anterior vesical wall were torn: in that published by Wahl (*Bayr. Aerztl. Intelligenz-Blatt*, 4, 1877), the urethra was torn.

laceration. The infundibuliform pelvis ought to be most liable to this accident, but we have only a single instance on record, in which rupture occurred.

Rupture is generally due to the expenditure of excessive force, and consequently mainly occurs during forceps extractions; there are but few observations in which the injury accompanied manual extraction of the head. Further, during forceps operations it is especially the traction which is exerted prematurely and too violently against the pubic arch, and the dragging into, and through, it of a part of the fœtus which is too broad to pass (as when an occipito-posterior head, or one placed transversely, is extracted), which are liable to stretch the symphysis and to disjoin the articular surfaces. These are the factors which Ahlfeld, and doubtless correctly, regards as ætiologically the most important, in those cases in which there is no primary disease of the joints.

In one or two instances, the separation only occurred during the post-partum period, when the woman happened to slip and fall. Such an event is only explicable by supposing that an incomplete laceration occurred during labour, and that the fall was the means of entirely rupturing the ligaments which still held the bones together.

Symptoms and Progress.

§ 760. The question of injury to the articulation having occurred, is sometimes settled by the parturient woman actually feeling the rupture, or hearing a crack; even the bystanders may perceive the latter. There may also be sudden pain in the region of the joint, and the head, which has hitherto been delayed, will quite unexpectedly make rapid progress. Some sound is likely to accompany the rupture, and crepitation be obtainable, especially if the cartilage has on one side been detached from the bone. The advance of the head results from the increased capaciousness of the pelvis, although our experience derived from cases of symphysectomy and experiment, shows that the increase is generally inconsiderable, and only amounts to .5 cm. (.2 in.) as regards the conjugata vera. But according to Ahlfeld's investigations, it may be much greater, if the articular surfaces at the ilio-sacral joints are separated, and if, the sacrum

being for the moment regarded as a fixed point, the symphysis is forced down.

In the slighter cases however, and these form the majority, the above symptoms are absent; and even the severe pains in the affected regions (of which undoubtedly most women complain) do not enable us to arrive at any definite conclusion, since such pains are common after difficult labours. Under such circumstances, the secondary phenomena are alone pathognomonic: viz. external rotation of the thighs (so that knees, legs, and feet rest on their outer surface), inability to move them, and great local tenderness; the latter is increased by pressure and rendered very acute, if the least attempt is made to move the thighs actively or passively, while on the other hand it is relieved by fixing the pelvis with the help of a belt. It is easy to prove that the symphysis is lacerated (even where it is incompletely so), by alternately pressing on the ends of the bones, and by the combined internal and external examination. If the vagina is also injured, the practitioner may occasionally be able to pass his finger into the rent. Rupture of the ilio-sacral synchondrosis is more difficult to discover. Crepitation is usually absent, while in most cases there is pain on pressure, even with an uninjured joint; it is only the severe pain, which is experienced when the anterior superior ends of the iliac bones are alternately forced together and pulled apart, that renders the presence of rupture extremely probable.

Symptoms connected with the bladder (incontinence of urine), only show themselves forthwith, where the symphysis is entirely split, and the neck of the bladder injured. With incomplete laceration, they will generally be absent, all the more so, the earlier the mischief was detected and the joint properly fixed; if the latter was not attended to, the above phenomena usually develop at a later period, as a result of inflammation and suppuration of the articulation.

The *termination* of a case of rupture is almost always favourable, where it has been early detected and treated. An unfortunate issue is rare, except when other injuries and puerperal infection are also present; even incomplete recovery (i.e. an abnormal mobility), as a result of which the women walk with an unsteady gait or need crutches, is a rare exception. If however the injury is left to itself, a pus-containing cavity generally

forms between the articular surfaces, and although even then recovery is possible after the formation of callus, such an event is uncertain, and there is great danger of suppuration in the joint, with its calamitous sequelæ. Confinements after recovery from this injury, have almost always passed off easily; it is therefore probable that the division of the symphysis has led to a *permanent widening of the pelvis*. On the other hand an excessive formation of callus is said to have obstructed the exit of the child.

Treatment.

§ 761. The treatment of a case of recent rupture consists in simply fixing the joint by a pelvic girdle, and directing the woman to keep absolutely quiet on her back, and on a firm, elastic, smooth mattress for a few weeks. Great care is required, while the changes of posture required for the sake of cleanliness are carried out. The bowels should not be allowed to act for some time. The best girdle is an ordinary towel, which can be adjusted so as to suit any particular case. The lying-in woman must be laid with her sacrum over the middle of the towel, the upper edge of which is brought round her hips, just beneath the crests and spines of the iliac bones, in such a way that no traction is made on the ilio-sacral joint by pressure on the former. The ends of the towel are now to be drawn tight, and fixed with pins over the symphysis. Where there are bony projections, some cotton wool should be interposed. If any displacement of the articular surfaces is present, this must of course be rectified, before the bandage is applied.

The same treatment may be adopted, where the case is not seen until some days after rupture. Any co-existing or secondary troubles will require appropriate remedies, in regard to which I need not here go into detail.

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5. Disorders connected with the Umbilical Cord.

Most of the disorders connected with the umbilical cord, and amongst them its compression through being coiled round the fœtus, have already been described under Pathology of Pregnancy (Vol. i., p. 475). Obstruction to labour resulting from abnormal shortness, has been discussed in § 657, and the laceration of separate vessels in § 679. Here therefore I have merely to deal with rupture of the whole cord, and with its prolapse by the side of the presenting part.

a. Ruptures of the Umbilical Cord.

§ 762. The umbilical cord only ruptures, when subjected to some great strain, *i.e.* when it is either absolutely or relatively too short. Such a strain may either be a gradual one, and accompany the transit of the fœtus through the pelvis, or it may arise from some sudden momentary jerk, as the fœtus is shot out of the external organs, where therefore its weight, *plus* a powerful *vis a tergo*, exert their full force on the cord.

It is extremely rare for the cord to be torn through as a result of gradual stretching. For the retracting body of the uterus, as well as the placenta, keep pace with the advancing fœtus, and the cord therefore, in spite of its being twisted round the fœtus, almost always remains sufficiently long; moreover the great elasticity of the tissues of the cord allow of its being considerably stretched. Such a kind of rupture therefore only occurs, when the fœtus has nearly, or entirely, left the body of the uterus (*e.g.* when the head is emerging from the parturient canal), when the cord is thin and but little elastic, and when its extensibility is lessened by the tightness of the coils round the fœtus. In this way must be explained¹ the observations quoted by Hohl (*Lehrbuch*), as well as the instance recorded by Nægele (*Heidelberger Annalen*, iii., 1827, p. 489), in which partial rupture took place during delivery.

Rupture occurs most frequently, when the child is, so to speak, shot out of the parturient canal. Under such circumstances, the

¹ I have seen a case of spontaneous rupture in the hospital here (*op. Citique*, 1877—8). It occurred, while the upper half of the child's body was being expressed, the lower having been spontaneously expelled in a breech presentation. The cord only measured 25 cm. (9½ in.), and was very firm. The tear occurred close to the insertion into the placenta.

fall of the child is generally associated with delivery in the erect, or nearly erect, posture of the mother; or a distant fall may accompany delivery in a privy. But even with labour in the dorsal position in bed, rupture has been observed, where a strong pain or a violent action of the abdominal muscles forced the child a long way out of the external organs'; in these cases however, the cord must previously have been greatly stretched.

Occasionally the accoucheur ruptures the cord, while performing version, and even oftener during extraction. In the former case the accident is inexcusable; with the last-named operation it may be, although it very rarely is, unavoidable. The injurious influence on the fetus due to the rupture, is less marked than is that caused by the extraction.

The distance of the fall is not so important as a causal agent, as are the rapid exit of the fetus, the velocity of the fall at its commencement, and the sudden strain on the cord. There must of course be a fixed point at the placental end of the cord; but it is not necessary, that the placenta be still firmly adherent to the uterus, indeed it is usually detached before the time at which the fall occurs. The placenta however, without being adherent, often enough opposes a prolonged resistance to the pull, as a result either of its retention above the closed internal os, or of the highly sinuous direction of the cervical canal, a fact of which the practitioner may easily convince himself by attempting to extract a detached placenta, which is still lying *in utero*, by merely pulling on the cord. Again, sudden rupture is favoured by the cord possessing many spiral twists, by a varicose or looped condition of its vessels¹, which prevents both the operating force from being equally distributed over the entire length of the cord, and the uniform development of the cord in regard to thickness. Hence too we find that the tissues which lie nearest to the imaginary longitudinal axis, are the first to tear, i.e. the amniotic sheath at the concavity of a twist; then generally the arteries and the vein, and lastly the convex side of the sheath. And since in the majority of cases the twists and varicosities are more abundant in the neighbourhood of the navel than near the placenta, we can not only understand why the rupture generally takes place in the fetal half of the cord, but why it does so pretty near to, or even at, the navel.

¹ Cf. Spath, *Klinik der Geburtshilfe*, 1853, p. 75; also Dupuy, *Gazette Obstétricale*, No. 19, 1877.

² Cf. also Cuzzi, *Centralblatt für Gynäkologie*, 1874, p. 101.

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and it not to be removed from the

§ 763. The torn ends are always irregular, never quite transverse and smooth, as if cut through. Especially is this noticed in the case of the amnion, which generally tears in the direction of its length, and is always irregular. The more slowly the rupture occurred (as for instance when it is torn by the hand), the more irregular are the ends, the further too are the several portions of the cord separated from one another. Moreover the tear is all the more oblique and shreddy, the sharper the spiral turns and the more irregular the course of the vessels; and conversely the more violent and sudden the jerk, and the smoother the cord, the more does the tear approach to being transverse (one end may be quite transverse), and the more even is its margin.

Copious *hemorrhage from the fetal end* is not likely, except where rupture occurred spontaneously and during delivery. It is probably always absent, where the child falls, if only the tear takes place at some distance from the navel; the bleeding is then checked by the previously stretched walls of the vessels becoming rolled in, and owing to the weakness of the *vis a tergo*. Hemorrhage is more probable, when the rupture is close to the navel, or actually inside the umbilical ring, and will then generally be more injurious, since the blood, which otherwise would flow into the child (*cf.* Vol. i., p. 262), as the placenta is expressed by the uterus, will be lost to it. At any rate the fetal end of the cord should always be immediately ligatured. If the rupture occurred at the navel, the vessels should be picked up one by one and tied; when too much retracted to allow of this, they should be circumcluded (*umstochen*).

b. Prolapse of the Umbilical Cord.

§ 764. If, during the course of parturition, the umbilical cord abandons its position in the concavity of the foetal ovoid, and descends by the side, or in front, of the presenting part of the child, or slips down into, or even outside, the parturient canal, it is said to be prolapsed. The old custom has been (*Nägele*) to speak of a cord as *presenting*, when it can be felt within the still intact bag of membranes; as *prolapsed*, when it passes out of the bag, after this has ruptured. Sometimes "prolapse" develops out of a "presentation", while in other cases the cord only descends by the side of the presenting part simultaneously with,

or after, the escape of the liquor amnii. The prolapsed portion generally lies in one of the posterior bays (i.e. by the side of the promontory) of the pelvis, or else against its lateral wall, rarely at the anterior, and most rarely of all directly in front of the promontory. The part of the cord that is prolapsed, may vary in length; sometimes a large loop descends into the vagina. The two limbs of the loop generally lie close together, but are sometimes separated by the presenting segment of the fœtus. At other times the loop runs over the latter like a tense band, and this will be most likely to happen, when there are coils round the neck of the child, and when a loop that passed loosely round the latter, has slipped down over the occiput.

Statements, in regard to the frequency of prolapse, vary exceedingly. Those of Saxtorph, Churchill and Scanzoni were based on large collections, and fixed the ratio at 1 : 243, 1 : 232 and 1 : 254 births respectively, while others show a much greater frequency, e.g. 1 : 80—90¹. Data based upon individual observations, or upon those of only a few Lying-In Institutions cannot decide the question, since the frequency of the anomalies (especially pelvic contraction), which are the principal cause of prolapse, varies so greatly in different Institutions, and only very large numbers can even approximately eliminate such sources of error. Many published observations only refer to the frequency of this complication in head presentations, others give it completely. All we can say therefore is that prolapse of the umbilical cord occurs once in not quite 200 births², but that its frequency rapidly rises with the number of anomalies and irregular presentations, as is easy to understand from a consideration of the causes. Whether the posture of the parturient woman, which varies in different countries, affects the frequency, as was suggested by Sir J. Simpson, is an open question. Simpson would explain the greater frequency which is shown by our German statistics, by the fact that the parturient woman in Germany usually lies on her back with raised shoulders.

¹ Cf. Michaelis, 1 : 88. Winckel, *Berichte*, vol. i., 1 : 70; *Berichte*, vol. ii., 1 : 168; in my practice 1 : 86. Hecker (*Beobachtungen*) 1 : 90.

² The Dublin Rotunda gives 1 : 168; a collection published in a Dissertation by Lebovitz, "Ueber Vorfall der Nabelschnur bei Beckenendlagen," Berlin, 1870, yields 1 : 189.

Causæ.

§ 765. *The circumstances, under which the umbilical cord becomes prolapsed, will be readily understood, if the following considerations are borne in mind. Under normal conditions, even during the latter portion of pregnancy, the presenting head is kept in contact with the lower segment of the body of the uterus, partly by the weight of the fœtus, partly by the intra-uterine tension and the intra-abdominal pressure. During the "pains" this contact becomes even more intimate, since the head, by means of a ball-valve action, transfers the intra-uterine pressure to the cervix, and thus, as well as by its own weight, expands it. The close and all round application of the lower segment of the uterus to the head grows still more intimate, when the head begins to descend after the escape of liquor amnii, and thereby yet further expands the lower portion of the cervix; this indeed is the mechanism, by which the liquor amnii which still lies behind the head, is retained. If on the other hand this reciprocal and all round contact is wanting, then, while the ovum is still intact, the umbilical cord may descend into the lower end of the ovum, since its specific gravity is higher than that of the liquor amnii; it may either be floated out of the amniotic cavity, at the same time that the amniotic fluid is discharged, or else descend subsequently during the pains. This occurrence is favoured by the erect posture, especially if the woman is standing at the moment of the rupture of the membranes; by undue length of the cord¹; by insertion of the latter into the neighbourhood of the internal os, when the placenta lies low (which can usually be afterwards diagnosed from the entirely lateral or marginal rent in the membranes²), and by insertio velamentosa.*

The principal conditions, which cause the lower segment of the uterus to be incompletely or at any rate inaccurately applied to the presenting part, are first and mainly transverse and

¹ In 124 cases collected by Hecker (*Beobachtungen*, p. 63), the cord was longer than usual in 22 p. c., and averaged 69 cm. (27 in.).

² Hecker (*Klinik*) found such a tear 20 times in 23 cases; Abegg (*l.c. sub Literature*) 19 times in a similar number of cases (cf. also H. F. Naegele, *Die causa quædam prolapsus funiculi umbil. in partu, non rara illa quidem sed minus nota* Heidelberg, 1839).

pelvic', especially footling, presentations; next a condition in which the presenting head deviates to one side, and does not engage in the middle line; prolapse of the limbs by its side; hydramnios; the presence of multiple fœtuses; and pelvic contraction. These are therefore individual causes of prolapse; but several of them not infrequently operate simultaneously. Pelvic contraction is one of the commoner causal elements; partly because with it the head frequently does not fit square into the brim, partly also because the lower segment of the uterus hangs more or less far down into the pelvic canal, while the head remains fixed over the brim. Consequently prolapse is met with in those malformations of the pelvis, in which there is partial and asymmetrical contraction; it is absent, whenever the presenting segment of the cranium can engage fully and firmly, and square to the brim (*e.g.* with uniform contraction, where the occiput engages).

Multiparæ are more frequently affected than *primiparæ*², since in the former at the beginning of labour the head does not usually lie so deeply in the brim, and does not force itself so strongly into the cervix as with the latter; moreover the lower portion of the cervix is more resisting in *primiparæ*. Hence we are more likely to find a loop of the cord lying in the intact bag of membranes in the case of *multiparæ*, which loop however, as the pains grow stronger and the head advances, is usually pushed to one side by the latter, or else retracted from before it. If however the membranes happen to rupture prematurely, the presentation of the cord is likely to be converted into a prolapse. Again, the greater frequency of the latter in *multiparæ* results especially from the greater frequency, with which many of the separate causes co-operate. When the prolapse is met with in a *primipara*, it generally accompanies pelvic contraction or a pelvic presentation. Hecker has observed an unusually large number of *boys* in cases of prolapse, and with head presentations a marked preponderance of the *second position*.

¹ We find as many as 1 case of prolapse amongst about 10 pelvic presentations (Hecker, *Beobachtungen*, gives 1 to 13), and this frequency is largely due to footling presentations. In transverse presentations the exact frequency can hardly be stated, since the prolapse is looked upon as a matter of secondary importance, and is not specially referred to; Hecker sets the ratio at 1:7.

² Hildebrandt (*l.c.*) states that out of 100 cases, only about 15 occur in *primiparæ*; Hecker (*Beobachtungen*, p. 61) found the relation in head presentations to be 100 *primi-* to 225 *multiparæ*.

The *premature rupture* of the membranes is not a cause of, nor does it render the woman specially liable to, prolapse. H. as Hugenberger ("Ueber den vorzeitigen Blasensprung," *Petersburg. Med. Zeitschrift*, 1872, iii.) states, such ruptures occur three times as often in cases of prolapse as at other times, this must be due to both anomalies arising from much the same causes.

Diagnosis.

§ 766. The diagnosis is extremely simple, when the cord has prolapsed, whether there be pulsation or not. Mistake is only possible in the rare condition in which merely a narrow strip of the cord lies between the presenting fetal part and the edge of the pelvic brim, and where consequently the diagnosis is apt to be missed on a cursory examination. Even then however the influence of the prolapse on the fetal pulse would show itself; and a discovery of this, perhaps otherwise inexplicable, influence, will lead to a thorough exploration, which must result in the discovery of the disturbing element. Where the loop is still lying within the bag of membranes, it will be possible during the interval between the "pains" to feel through the membranes a soft, movable mass, which is twisted like the intestine, and which cannot be confused with anything else, even when it does not pulsate. Nor can its pulsation be confused with that of the exploring finger, since they are not isochronous; there might be more risk of mistaking a vessel running in the membranes for the cord; but such vessel will not float about like the cord.

In reference to the diagnosis as to whether the fetus is alive or dead, it must not be forgotten that during the pains accompanying the period of expulsion, the umbilical pulsation sometimes momentarily ceases, and at once re-appears, as the pain passes over. The cord too may actually be non-pulsating, owing to its being compressed, and thus cut off from the heart, while the latter continues to beat. Under such circumstances the only reliable plan is to auscultate the fetal heart, unless indeed the cord has ceased to beat for a number of minutes, and is flabby and loose. This will be its condition, where the circulation has been interrupted for a considerable time, when the life of the child must necessarily be extinct.

Prognosis.

§ 767. Prolapse of the cord is scarcely ever of importance to the mother; indeed it can only do her harm by possibly rendering interference necessary. At most might the generally trivial consequences of the cord being too short, show themselves, if the prolapsed loop happens to be tightly stretched over the presenting head, or if with a pelvic presentation the child "rides upon its cord" (§ 657).

From the child's point of view, on the other hand, this complication ranks amongst the most serious. The investigations of Scanzoni and Churchill show that more than half the fetuses are born dead (55 and 53 p. c.); older collections reveal a still less favourable result, recent ones (*cf.* Massmann and Hildebrandt, *l. c. sub* Literature) a somewhat better one, so that here also a *modus operandi*, which is founded on a clearer understanding of the condition, seems to have led to material improvement. Hecker has only had a mortality of 37.6 p. c. in his 194 cases.

The fact that the danger to the child mainly arises from pressure on the cord, and from the consequent arrest of the foetal interchange of gases in the placenta (the foetus perishes from asphyxia), proves that the danger is not equally great in all cases; there are various secondary modifying conditions. In the first place, the prolapse is comparatively unimportant in *transverse presentations*, since the cord is only slightly, if at all, compressed, while the abnormal presentation requires rectification for its own sake. Again, *pelvic presentations* permit a tolerably good prognosis, since the presenting part is but little hard and bulky; the less its size, the better the prognosis. The latter therefore will be worst in pure breech, most favourable in incomplete footling presentations; with the former the prolapse may be especially dangerous, if it occurs at a time when the os uteri is but slightly dilated. On the other hand the gravity of this complication in pelvic presentations is considerably diminished by the fact that, as soon as the abdomen of the foetus advances into the pelvis, the cord must invariably be exposed to pressure, and that the delivery must therefore from this moment onwards be artificially hastened, and that this is usually easy of accomplishment. It is true however that breech pre-

sentations, particularly in primiparæ, not uncommonly form an exception in this respect.

Prolapse is most dangerous with *head presentations*¹. Here the prognosis in any individual instance depends on the cause of the prolapse, on the period of labour at which it occurs, on the region of the pelvis at which the cord comes down, and on the conformation of the parturient passages. These are the factors, which determine whether it will be possible either to withdraw and keep the cord out of reach of the compressing agent, or else (when that is impossible) to remove the child sufficiently early by means of speedy delivery. A prolapse, which is due to the insertion of the cord into the lower edge of a placenta, which is itself attached too low down, can never be permanently remedied, and the same is generally true of that caused by pelvic contraction. Moreover the interests of the mother rarely allow of an operation being undertaken for the preservation of the child, since the prolapse generally occurs before the complete canalisation of the cervix, and any interference at such a time involves extreme danger both for mother and fœtus. On the other hand the unfavourable prospects which prolapse yields as regards the child, in cases of pelvic contraction, constitute an advantage to the mother, inasmuch as the death of the fœtus (which under these conditions takes place early) allows us to conduct the labour, regardless of any, except the mother's, interests.

§ 768. *Early prolapse*, i.e. prolapse while the os uteri is but little dilated, generally yields the least favourable results, nor are the reasons far to seek. *Late prolapse*, i.e. prolapse subsequent to complete dilatation of the os, yields the best, provided the pelvic contraction is not very considerable; where it is, the life of the child will of course be in extreme danger, quite apart from the descent of the cord. I, like others (cf. especially Schmidt *sub* Literature), have repeatedly seen the spontaneous and successful delivery of a child under the favourable condition just mentioned, or at any rate have without difficulty been able to save it by means of artificial extraction. The reason why prolapse at the *anterior pelvic wall* is more serious than such near

¹ Engelmann (*l. c.*) found amongst 292 cases a mortality of 64 p. c.; with footling presentations of 32 p. c. Hecker has had a mortality of 43 with head, but only of 17 p. c. with pelvic, presentations.

the ilio-sacral articulation, is to be found in the higher pressure which is exerted on the former.

So long as the umbilical cord merely *presents* (cf. § 764), the danger is practically *nil*, since no very strong pressure can under such circumstances be exerted upon it within the ovum. Still this absence of danger with an intact bag of membranes must not be regarded as an axiom, since the head or the breech can, even while the membranes are intact, provided they are elastic and tough, descend into the brim, and if this happens, the cord can of course be compressed between the child and the latter, much in the same manner as after the liquor amnii has escaped. Indeed I have more than once, in cases of pelvic contraction, seen the head undergo its usual mechanism at the brim, indeed pass through it, while the portion of the bag of membranes which presented, and which of course was completely shut off from the remaining liquor amnii, was still intact, and reached far down into the vulva. Fritsch too (*Klinik der Geburtshülf. Operationen*, 2nd ed., 1876, p. 200) mentions such an occurrence. Supposing again that, during the period of dilatation, the relations in the fore-waters become different to what they were when the cord first presented, supposing for example that the presenting part of the fœtus descends and that the cervical segment becomes closely applied to it, while the cord remains *in situ*, then the latter will be subjected to pressure, although still inside the bag of membranes. It is therefore not the integrity of the bag of membranes that protects the presenting cord, but merely the fact that, while the membranes are intact, there is usually (although not invariably) no pressure between the head and the parturient canal.

Treatment.

§ 769. The above remarks will show that the one object of treatment must be, either to *place the cord beyond reach of pressure*, or, if this cannot be done, to *withdraw the fœtus from its imperilled position*. No question of treatment therefore can arise, where the child is dead; the practitioner should act precisely as he would do, if the complication did not exist.

a. Head Presentations. If the cord is still within the membranes, a purely expectant attitude should be maintained, so long as the cord is not exposed to any pressure, every

possible means being used to preserve the bag of membranes intact as long as may be. I regard it as unnecessary to introduce an india-rubber bag into the vagina with this object, such a proceeding being not unlikely to irritate the generative canal. The longer the bag of membranes remains intact, the more the os becomes dilated, the more rapidly can the child be born spontaneously, after escape of the amniotic fluid and after the actual occurrence of prolapse, if such spontaneous delivery is at all possible; in other cases it will be found all the more feasible to afford the required assistance. It is also possible that, as the head descends with the increasing expansion of the cervix, and as the lower segment of the uterus is gradually retracted upwards, the loop will by degrees be forced back, and pushed up over the greatest circumference of the head, while the membranes continue as yet unbroken. But during the whole of this period auscultation should be frequently practised, so that any impending danger may be detected in good time.

Should such danger show itself, the cord must be replaced, *even if the membranes are still unruptured*, provided the os is in a state to allow the accoucheur to introduce his hand. Reposition is then generally easy, partly because a large loop which is held together by the membranes can be more rapidly returned *in toto*, than one which has descended a long way into the vagina after discharge of the liquor amnii, partly also because the head can much more easily than afterwards be pushed in any desired direction. Should however the operation not succeed, version then becomes necessary; and this may also be easily effected, since the hand will have already been passed through the os with the view of returning the cord. After reposition, the bag of membranes must be ruptured, in case it has not burst during the proceeding, and the head must be brought firmly and fully into the inlet, so as to prevent any fresh prolapse.

If the bag of membranes ruptures spontaneously, where the parturient canal is in a thoroughly prepared state, then, if the canal no longer offers any material obstruction, and if the head rapidly descends into the pelvic cavity and the pains are good, *labour may be left to take its own course*, or merely be accelerated by expression. Indeed it is not rare for the child to make its exit so promptly, as not in any way to suffer from the prolapse; at

most does it look a little asphyxiated. I distinctly recollect six such cases that have occurred in my experience. But if delivery is unduly delayed, the *forceps* must be applied, so as under the conditions in question rapidly to extract the head, and promptly to put an end to the pressure on the cord.

§ 770. *If after prolapse has occurred (i.e. after rupture of the membranes), the head is still high and mobile, our choice lies between reposition of the cord, and podalic version followed by extraction, provided of course the os uteri permits the latter.* The *forceps* must not be thought of for a moment, partly because the head is both high and unfavourably placed (pelvic contraction is very common under such circumstances), partly because the parturient passages are but insufficiently prepared for the operation, at the time at which it would be required. Any success that follows the use of the *forceps*, is generally to be attributed to good fortune, rarely to skilful manipulations.

Reposition ought as a general rule to be tried before version. The objections, which some obstetricians entertain against it, are founded on the results of injudicious methods of procedure; with patience and experience success will be frequent, assuming of course that the conditions, which led to the prolapse, are remediable. Hecker (*Klinik*) only met with 3 failures amongst 23 attempts at reposition, Hildebrandt with 1 amongst 13; in 9 out of 25 cases, some of which were due to pelvic contraction and in which I myself effected the reposition, perfect success followed in 8.

The operation is performed *with the hand, while the woman is placed on her side, or in the knee-elbow posture.* No instrument can rival the hand in efficiency, or replace the cord so rapidly and skilfully, while moreover it is apt itself to grip and severely to compress the latter. *The knee-elbow posture*¹, although often very unpleasant to the parturient woman, is the best for several reasons. Thus in this posture the fundus is the most dependent portion of the uterus, and bears the principal weight of the uterine contents, while, as a further advantage, the intra-abdominal pressure is reduced to a minimum. Hence the cord, when pushed back into the uterine cavity, will as willingly return into

¹ It was first of all recommended by Deventer, afterwards by the most various writers (Küster, Theopold, Thomas in New York); recently it has been largely used, especially in England, under the name of "postural treatment."

that cavity, as on the other hand it tends to be driven down, when the woman is on her back. Lastly, the hand of the operator can more easily get past the head, and the latter is more mobile, while the liquor amnii, that still remains *in utero*, will for the most part continue there, when the hand is withdrawn.

The *whole* hand must of course be introduced; partly because it is necessary to penetrate deeply into the uterine cavity, partly because the whole prolapsed portion (not merely one part of the loop after another¹) must be replaced at once; while again a large loop can only be lodged in the palm of the hand, where too, it will be safest from injury. Meanwhile the free hand supports and fixes the uterus *ab externo*. If a pain sets in, the accoucheur should keep his hand perfectly quiet, while trying to keep in place the parts that have been reduced. Every effort must be made to push the loop up over the greatest circumference of the head, and, if possible, round the neck of the fetus. When this has been accomplished, the accoucheur must slowly withdraw his hand, so as to avoid drawing with it the cord which may perhaps be following, and, if necessary, at once to push it up again. It is well to try not to pull back the hand along the same track, as that by which it entered, but rather to push the head into the place which the hand previously occupied. The latter should be kept near the os for some time after reposition has been effected, and the parturient woman too should continue in the same position, at any rate until several pains have passed without recurrence of the prolapse. After this she may cautiously be placed on her side, or even better on her back, since it is important by means of auscultation to watch the results of the reposition. Even when the latter has succeeded, the pressure on the cord may not always have been got rid of; or the fetus may perish from the results of some previous interference with its circulation. Indeed where success seems actually assured, it is desirable, as a prophylactic measure, to let the woman lie for some time longer on her side, the semi-prone position (with raised pelvis and unsupported abdomen) being selected, since it approximates most closely to the knee-elbow. Where the prolapsed loop is on the right side, she should lie on the left, and

¹ It is to this mode of procedure only that Boer's statement (*Siden Hæker*, vol. 8) can be regarded as appropriate, when he says that "reposition is as hopeless a task as that of the Danaïdes, since the part which the hand replaces, is invariably smaller than the fresh piece, which glides down by its side."

vice versa; under other conditions on the side which is most suited to the way in which the head is lying and engaging.

If an arm has also prolapsed, the treatment recommended in § 650 should be adopted, the arm being, if possible, replaced with the cord. If by the side of the latter a foot comes down, this may also be pushed up, but as a rule it will be better by pulling on the foot, and pushing up the head, to bring about a podalic presentation.

It is not well however to expend too much time in trying to replace the cord; such efforts in themselves disturb the umbilical circulation, and are apt to injuriously affect the subsequent course of the uterine contractions! Indeed a very good guess can usually, and at an early stage, be made, whether reposition will succeed or not. As soon therefore as the accoucheur grows convinced of impending non-success, indeed even if, after reposition has actually or apparently succeeded, the fetal pulse shows serious alteration, the child should rapidly be withdrawn from the reach of danger, in other words *podalic version* should be performed. Where the space relations are favourable, this operation ought invariably to be undertaken, and is a prompt remedy. Whether *extraction* should immediately follow, depends on the condition of the uterus and of the fetal pulse. On the other hand where the pelvis is contracted (and it is then that reposition most often fails, since it is rarely found possible to bring the head into complete adaptation with the brim; indeed this would usually not be desirable), the question is different. If the pelvic contraction destroys all prospects of saving the child by version, the latter ought not to be performed, as for instance merely on account of the prolapse of the cord. The further course to be pursued must thenceforward entirely depend on the pelvic contraction. I have already pointed out how the prolapse in these cases is an indirect advantage to the mother.

§ 771. But if the prolapse occurs at a time when the os is still so little open and dilatable, that it is impossible to pass the whole hand through it, the practitioner may still make an attempt to replace the prolapsed portion with his hand, by placing the woman in the knee-elbow position, and pushing up the cord as high as he can with the help of two fingers. This operation is sometimes successful, mainly as a result of the posture, provided only the head entirely fills up the lower

segment of the uterus, when the cord has been returned. Only under exceptional and special circumstances will it be wise to incise the edge of the os, in order to facilitate the introduction of the hand (Hildebrandt).

As a rule however attempts made with the hand are unsuccessful in the cases in question, and *the help of a repositor may then be called in*. There are a great number of such instruments, constructed on the model designed by Michaelis, all of them pretty much of the same (*i.e. of very little*) value. The best is perhaps that of Murphy (fig. 120), since it is curved and can be used without risk of pressure on the cord¹. In former years I have used various instruments, but only rarely have I found them successful. A long loop cannot be carried *in toto* with their help above the head; and even if it could, we have no means of (inasmuch as the instrument hitches at every point)

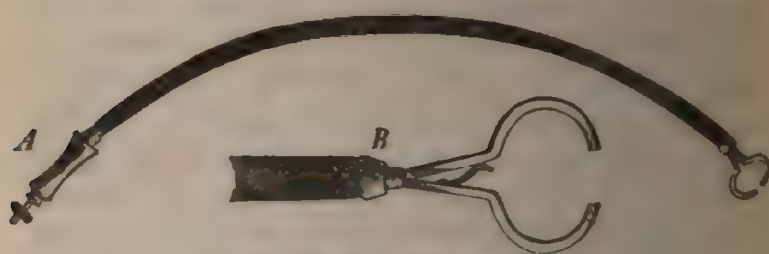


Fig. 120.—Murphy's Repositor.

A. Catheter with the ring closed.

B. End of the catheter, showing how the ring opens, when the stilet is pushed in.

locating it in the exact position that is necessary, if a recurrence of the prolapse is to be averted. For years therefore I have given up using repositors, and can only advise the accoucheur not to waste his energy in experimenting with them, particularly as there is much more risk to the life of the child, when attempts at reposition are made with an instrument, than when made with the hand.

Since then we have no power of hastening delivery, where the os is still narrow, the child must unhappily be looked upon as

¹ Murphy's repositor is an elastic catheter, through which passes a metal stilet terminating in two half-rings. The latter, after seizing the cord, are made to close by drawing out the stilet. After reposition the stilet is again pushed in, when the half-rings open, and allow the cord to escape.

almost certainly lost. At most might the accoucheur find it possible to postpone that issue, by directing the woman how she should lie, and by transferring the cord to one of the unoccupied pelvic bays (at the sides of the promontory), in order to allow the pressure upon it to be as slight and short as possible. Some obstetricians have advised that the head, which is exerting the pressure, be pushed to one side, and that a transverse presentation be produced and maintained, until the os has grown sufficiently large to permit of version; but this should only be done, when the space relations are quite normal. Where the pelvis is contracted, we should be driven to an operation, whose successful result for the child could never be prophesied with any degree of confidence. Indeed under these circumstances it would be better only to consider the mother, *i.e.* to give up the child as hopelessly lost, and merely to try and render the delivery easy to the mother, *capite prævio* (*cf.* § 537).

§ 772. *b.* With pelvic presentations, a prolapsed cord is usually only exposed to pressure (as already observed), while the trunk is passing through the pelvis. Consequently the prospects of such a case are not much worse than in an uncomplicated labour, since of course at this period the cord is always liable to pressure. As soon as there are symptoms of such pressure, extraction should, if necessary, be undertaken, and this is not difficult to accomplish. The only exception is sometimes met with in pure breech presentations, where the breech is bulky, and the lower part of the trunk greatly curved, in consequence of which it is mainly the sacral surface which presents. The condition then becomes very similar to that accompanying a head presentation. Reposition however is as a rule not advisable, since when the loop can be carried high up, and the hand therefore can also be passed in deeply, the better plan is to bring down a foot. The diminution in the size of the advancing part, which is thus effected, arrests, or at any rate greatly diminishes, the pressure on the cord, while moreover the foot affords a handle, with which the extraction can at any moment be completed. Moreover it is easier to bring down a foot than to carry the cord well up, while in addition it can be done when the os is still comparatively small. Where however the breech has descended so far, that the foot can no longer be brought down, it will also be impracticable to replace the cord, and the best plan will then be to extract the foetus

breech first, as soon as the foetal circulation renders this necessary. If this is prevented by the insufficient dilatation of the os, in spite of the low position of the breech, nothing can be done for the fetus, although of course it is in great danger.

c. With *transverse presentations*, prolapse only comes up for consideration, in so far as it necessitates *cephalic version*, if the conditions are otherwise favourable. Sometimes it is found possible while replacing the cord, at the same time so to bring down the head, that no recurrence of the prolapse takes place. *But where this is not the case, no further trouble should be taken in regard to the complication.* The cord is only exposed to dangerous pressure, if the shoulder is forced down into the pelvis, when of course the abnormal presentation ought in any case to be rectified as speedily as possible. There is no object in replacing the cord before, or during, version, since it delays the latter, and injures the cord without any corresponding advantage, and since, when a podalic presentation has been produced, the extraction can at once be completed, if there is pressure on the cord.

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6. *Tympanites uteri, Physometra.*

§ 773. These names are given to the condition in which gas collects in the uterine cavity, an essential requirement for which is the entrance of atmospheric air during labour. If delivery terminates shortly after such entrance, no further results follow; but in other cases this air, assisted by the moisture and warmth

of the uterine cavity, leads to decomposition of its contents, and the cavity fills with putrefactive gases.

The entrance of air into the uterus is sometimes due to violence; in other words air is pumped in at the time of an intra-uterine, or even intra-vaginal, injection of water, owing to the bad construction and management of the injecting apparatus, and this may occur even without the membranes being ruptured, the internal uterine pressure being overcome by the force of the injection. At other times the entrance occurs spontaneously, and this is what happens in the majority of instances, in which tympanites uteri is present. But for this the liquor amnii must have been discharged, there must no longer be a general internal uterine pressure (at least not at the moment the air enters), the lower segment of the uterus must not be entirely blocked by the presenting part, and there must be a channel for the passage of the air. Such a channel may be produced through the examining or operating hand forcing the walls of the vagina and the edges of the os apart. The two first conditions mainly accompany pelvic contraction and abnormal presentations, especially when labour has already lasted a long time, when the uterine wall is exhausted, and is only feebly, or not at all, contracted. The entrance of air therefore is commonly observed after attempted operations and intra-uterine explorations, where the hand raises the uterine wall from the fœtus; indeed at such times the air may enter with an audible hissing and gurgling sound. The occurrence is favoured, and may indeed during an otherwise normal labour be entirely produced, by some particular postures, for instance by those (e.g. the dorsal and knee-elbow postures) in which the intra-abdominal pressure may be extremely slight or momentarily quite absent; still more by a rapid change from the dorsal into the knee-elbow, since a kind of suction action may result from such change; moreover by external manipulations, or by a sudden arrest of the external pressure, while the hand is still within the parturient canal, or where there is an injury to the parts (i.e. those about the vagina and os) which usually offer resistance to variations of pressure. Those instances too must be referred to aspiration, in which air enters immediately after the rupture of the membranes, and which are referred to by Olshausen'; if air happens to be present in the parturient

passages, just at the time that the amniotic fluid is discharged, and if the uterus does not contract sufficiently, air will enter in the place of the liquor amnii.

The entrance of air during labour is not as rare as might be supposed, from the slight attention which is devoted to it in text books. I have met with it in a by no means inconsiderable number of labours, with transverse presentations and especially with contracted pelvis; but there had invariably been great delay, and the head was always still high and movable above the brim. Sometimes the entrance could be made out objectively before the completion of delivery, in other cases only at the time of the expulsion of the fœtus, when the latter was followed by collections of air; or else these were expelled, when the uterus was compressed and the placenta expressed. Indeed there can be no doubt, that the offensive discharge, which so frequently shows itself, when a labour is greatly delayed, even when the life of the fœtus is not yet extinct, is invariably the result of the operation, on the inner surface of the parturient canal, of air that has gained entrance. The admitted air however does not, in the majority of cases, immediately signalise its presence by marked phenomena and physical signs, for the reason that the quantity is usually but slight.

The nature of most of the cases in which air is admitted, and the fact that parturient activity is almost always absent or exhausted, usually require that the labour be *artificially ended soon after the air has gained admission*. And this is doubtless why the complication has usually no immediate bad results, although septic processes may begin in the inner wall of the uterus during labour, and only prove fatal during the puerperal state. Occasionally however, when there are injuries to the cervix, air enters the parametric connective tissue (§ 730); in a few cases too it may pass into the vessels, which have been opened at the placental site or at injured parts of the wall, and then prove suddenly fatal. Further, if the fœtus is still alive, respiration may set in prematurely, and again be interrupted, this, combined with its effects on the circulation, rapidly causing the death of the fœtus.

§ 774. If the labour is prolonged for a considerable period after the entrance of air into the uterus, *putrefactive gases develop*, as already mentioned. The death of the fœtus is not a necessary condition for this; I have more than once seen children born

alive, and yet followed by stinking gas, and the same has been recorded in other clinical accounts of labour. *But an abundant development of gas is always associated with the decomposition of the fœtus* (cf. also § 614¹). The quantity may then be enormous; the size of the uterus and abdomen rapidly increases, the abdomen feels tense and tympanitic, and yields a tympanitic percussion note. This note however is mainly due to the flatulent distention of the bowels (in itself a sign of commencing septic mischief), and diminishes from above downwards, the explanation being that the intestines are pushed up by the uterus, and that the gas within the latter of course first of all distends the upper portions, the lower ones being occupied by the fœtus. Occasionally however the intestines remain unaffected; the tympanitic note is then confined to the uterus, and varies in intensity with the amount of gas that has accumulated. Meanwhile the exhaustion of the uterine muscle, caused by the greatly prolonged parturient exertion, together with the expansion and continued distention of the uterus by the gas, so to speak, paralyse the *pains*; there is always a stinking discharge, with which air bubbles are sometimes mixed, especially during an examination. Again the parturient woman is highly dyspnoic, owing to her diaphragm being forcibly pushed upwards; she will also look very much collapsed, partly owing to the usually lingering illness, partly owing to the absorption of products of decomposition into her blood. That the gas is not expelled through the os and vagina, is due in part to the fact that the former is blocked by the advancing portion of the fœtus, in part to the uterine inertia.

The *diagnosis* will be easily made from the above symptoms, provided the possible development of gas is always thought of, whenever labour is very prolonged.

§ 775. The further course of events, in other words the *prognosis*, mainly depends on the time during which the condition has lasted, on its severity, and on the interference that is required. In severe cases the issue is usually unfavourable, frequently fatal. There are several sources of danger. In the first place death is not unlikely to be caused by the entrance of gas into the veins (even more so than where merely air has

¹ It may also be derived from a decomposing clot of blood, when a considerable interval separates the birth of twins, or when a clot is left behind after the delivery of the first twin.

penetrated into the uterine cavity), since where putrefactive gases are formed, the placenta is usually partially detached and injuries have frequently been already produced. Then again death may also (as in the case of Dohrn's mentioned in § 730) be due to rupture of the undermined peritoneal lining, and to the escape of gases into the abdominal cavity. But the greatest risk of all is that of acute septic poisoning and of local septic processes after delivery; the latter rarely fail to show themselves, when the parturient canal is bruised and lacerated.

Where the physometra is less severe, and especially where its duration is short, the prognosis is better. If there are no tears, if no septic infection has as yet occurred, if the uterine cavity is thoroughly emptied and cleansed, and if the uterine retraction is uninterfered with, the puerperal state may end favourably, or with only a slight febrile disturbance. Much therefore depends on the way in which labour is ended, and on the after treatment.

The prognosis as regards the *fœtus* scarcely needs consideration, since the development of gas is usually due to putrefaction of the former, and these labours will almost always be lingering or complicated ones.

Treatment.

§ 776. It is not always possible to prevent the entrance of air, even when the various changes of intra-abdominal and intra-uterine pressure, which may give rise to it, are carefully watched. If however such entrance has occurred, if putrefactive gases have developed, the practitioner should terminate the labour as rapidly as possible, while taking every possible care of the mother; on no account must she be injured. If there are difficulties in carrying out this advice, he may at any rate get rid of the gases, by passing wide tubes far into the uterine cavity and applying external pressure, while that cavity is at the same time irrigated with a warm, not too weak, carbolic lotion. The gases are usually discharged spontaneously, when the *fœtus* is expelled, but it is also a good plan to exert vigorous, manual compression on the uterus *per abdomen*, so as to insure their complete discharge before, as well as after, the expulsion of the placenta. The uterus and vagina should therefore be repeatedly irrigated with carbolic lotion, in order to remove any septic matters that may still be adherent, and thoroughly to disinfect the mucous

surfaces. The accoucheur should also make sure that the retraction of the uterus is well maintained (by binder, ergot), and continue antiseptic measures for some time longer.

LITERATURE.

Valenta, *Zeitschrift d. Gesellschaft d. Aerzte zu Wien*, 1857, Nos. 7-8; Winckel, *Berliner Klin. Wochenschrift*, 1864, No. 9; Stahl, *Dissertation*, Halle, 1872; Wächter, *Dissertation*, Munich, 1875; Staude, *Archiv f. Gynäkologie*, x., p. 385, and *Zeitschrift f. Geb. u. Gyn.*, iii., p. 191.

7. Collapse after Delivery. Sudden Death during Labour and the Puerperal State¹.

§ 777. Collapse after delivery, when not due to hæmorrhage from, or rupture of, the uterus, usually arises from exhaustion brought on by the preceding exertion. Occasionally however in very sensitive individuals, even after an otherwise normal labour, such a state of exhaustion is met with, but this soon disappears with rest and appropriate treatment (warmth, opium), without doing permanent mischief; where on the other hand labour has been difficult and prolonged, the subsequent weakness, excitability and loss of tone may be more persistent, and require the greatest attention on the part of the medical attendant. But in more robust women too attacks of deep unconsciousness are sometimes observed, when the uterus has very rapidly expelled its contents, and when, through the sudden lowering of the intra-abdominal pressure, and the great repletion of the numerous and wide veins of the abdominal cavity, the brain and cardiac vessels are momentarily rendered highly anæmic. But these attacks also are easily managed, and need not cause alarm.

It is otherwise, when parturient or just delivered women are attacked by unconsciousness, without such easily detectable cause; the very absence of any obvious explanation adds to the gravity of the condition. Indeed such attacks are usually of the same nature as those that lead to the sudden death of parturient or lying-in women, and, although usually only slight degrees of the same process, they may easily prove fatal.

¹ The analogous cases of death during the puerperal state will also be described here, so as to avoid repetition.

A parturient or recently delivered woman may suddenly die from hæmorrhage, from rupture of the parturient canal, from an attack of eclampsia, or from various other causes, some of which have already been mentioned. She may likewise perish as a result of pre-existing disease (especially of the circulatory or respiratory organs), to which the exertion of labour and the alteration of blood-pressure (which accompanies labour and the evacuation of the uterus) are super-added as aggravating factors; for details I must refer to the Pathology of Pregnancy (cf. § 243). In these cases however the fatal result is not actually *unexpected* in the strict sense of the word; unexpected death, strictly speaking, generally arises from one of two conditions, which are in close ætiological connection with the puerperal changes in the uterus, and with the changes that take place in it during parturition, viz.: *the entrance of air into the veins, and embolism of the pulmonary arteries*. Death, due to these causes, is more common in the puerperal than in any other condition, but is most common of all during labour and the first days of the post-partum state¹.

§ 778. (1) In a small number of cases death has been proved to be due to the entrance of air into the uterine veins. In others which have been supposed to be of the same nature, it is more probable that the gas, which was found at the necropsy, was a product of decomposition, or only got in during the post-mortem examination².

I have already explained how the air gets into the uterus. The necessary condition for its entrance into a blood-vessel is separation (at least partial) of the placenta, except in cases where the air has been forced directly into the vessel, through the cannula of an injection syringe having been thrust into the uterine tissues. Now there is no question that, both during and immediately after delivery, the uterine sinuses (resembling in this respect the veins of the neck) are in a condition, which predisposes to the admis-

¹ According to Menière (*Archives Génér.*, 1828, xvi., p. 489), cerebral apoplexy also appears to be commoner at this than at other periods of sexually mature life, but probably the women referred to were suffering from predisposing disease. Cases of death during the lying-in period due to rupture of a heart which, although formerly healthy, has lately been damaged by inflammatory mischief (an instance of which I have recorded in the *Monatschrift f. Geburtskunde*, xxviii., p. 489), or to other causes (e.g. rupture of the diaphragm or of an aneurism) belong to the rarest events.

² In cows the entrance of air from the uterus into the systematic veins is far from rare. (Cf. Harms, *Das Milchfieber des Rindes*, Hanover, 1878.)

sion of air; they (like the veins just referred to) are intimately connected with the adjacent tissues, they cannot collapse when opened, and their parietes are kept on the stretch, as long as the uterus is not con- and retracted. Again, the variations in the pressure, under which the air within the uterus must be during the rhythmical contractions of the latter, and still more the *aspiratory action*, which is exerted by the relaxation of the organ which follows upon a contraction, favour such entrance. All those cases therefore in which air is said to have passed into the vessels, while the uterine cavity was very full of gas, are very doubtful, since at such time the tension of the uterine wall must be too uniformly persistent and too great; moreover under those conditions the orifices of the veins and sinuses would already be thrombosed. On the other hand as soon as, with the expulsion of gas or the extraction of the child, the rhythm of contraction and relaxation begins (possibly a thrombus might at the same time be detached), the event in question may occur.

Death, due to the entrance of air into the uterine veins, is said to be most often observed immediately after delivery. The most striking examples however are the cases in which air has been forced into the uterus through an injection apparatus, *e.g.* the unquestionable instances recorded by Olshausen (*l. c.*), Litzmann (*Archiv f. Gyn.*, ii., 176) and Depaul (*Union Médicale*, 1860); possibly to this category belongs also that of Wynn Williams (*Lancet*, 1861), and certainly the one which I have seen, does, and which is recorded by Wiener in *Archiv f. Gyn.*, xiii., p. 95. In these cases, although the foetus was still *in utero*, the placenta was undoubtedly partially detached both before, and during, the injection, the vessels as yet not being thrombosed; the injection of water caused the uterine parietes to be stretched, and in consequence of this air was sucked into the veins.

In the above-mentioned cases, the *symptoms* were those of asphyxia, viz. lividity of the face, a rapid, scarcely perceptible, pulse, laborious, short breathing, cold skin, a strong sense of anxiety, trembling, convulsions, these being sometimes followed by unconsciousness and rapid death, sometimes by an interval of consciousness, and then by death amid the phenomena of suffocation. These symptoms are very similar to those met with in pulmonary embolism, and the diagnosis can probably never be more than a matter of suspicion, until proved at the necropsy.

It will scarcely be possible by means of auscultation actually to demonstrate the presence of air on the right side of the heart.

§ 779. There are however several difficulties in above explanation which attributes these cases of death to the presence of air in the blood. First of all we have the fact (which has been experimentally demonstrated by Uterhardt, and moreover is a well known occurrence in surgery) that considerable quantities of atmospheric air may be injected into veins situated a long way from the heart, without any serious symptoms being produced. Then conversely there is the further fact that death and dangerous complications only result, when a large quantity of air enters a vessel lying near to the heart, and gets into the right side of this organ; there the air either acts as a compressible medium which cannot escape, and thus prevents the cavity from filling with blood (Couty); or else—as Panum believes it forms a column which is but little broken up by blood, and passes into the pulmonary artery, where it momentarily arrests all circulation, prevents the left ventricle from receiving fresh blood, and thus produces a rapidly fatal anemia of the brain. When air passes into veins at a distance from the heart, the blood reaches the latter as an emulsion of air, and probably small emboli of air will remain in the little vessels of the lung. But since this disorder does not cause the severe symptoms, which have been described above, nor sudden death (indeed the symptoms frequently subside), we must suppose that in our midwifery cases either air was driven in a large quantity or under great force, and thus rapidly reached the heart, or else (and this is more probable) that a thrombus was washed away from the uterine wall, at the same time that the air entered, and that the air and blood emboli together gave rise to the symptoms which caused death.

§ 780. (2) *Plugging of the pulmonary artery* is the commonest cause of sudden death during the *post-partum state*, as has been particularly well shown by the valuable work of Hecker and Hoogeweg¹. But *sudden death during labour* also is, comparatively speaking, more often due to this cause than to the entrance of air into the blood.

Plugging of pulmonary arteries of the second and third degree is not rare, and usually depends on the transportation, either of

¹ Cst. *Deutsche Klinik*, 1855, No. 36.

a clot which has formed in the right side of the heart in consequence of disease of the endocardium, or else of some thrombus of more peripheral origin, thrombi being, as we know, frequently washed away during the puerperium, especially where there has been phlebitis in the pelvis or thighs. This occurrence does not cause sudden and unexpected death, although it may, where the last-named affections exist, provoke or accelerate the fatal termination. Sudden death is confined to cases, in which either *the main trunk or the primary branches of the vessel are plugged*, and for this there are several possible causes. In the first place *spontaneous coagulation* may take place in the right side of the heart and in the pulmonary artery. Many, especially English, writers suppose that the state of the blood during the puerperium predisposes to this. But such a view is probably only true in exceptional cases; if, at post-mortems, the blood is frequently found to have coagulated in the right heart and in the pulmonary artery, the clots must usually be regarded as having been formed during the death agony. Again, *thrombosis may be caused by marasmus*, and lead to sudden death, but only rarely, since the pulmonary artery and its branches are too much exposed to the direct force of the heart's action; such thrombosis only occurs, when the heart is extremely weak, during convalescence from serious illness, or owing to some other cause, and where the force of the pumping action happens at some particular moment to be so greatly lowered, that the blood is propelled with but little velocity, and coagulates close to the cardiac orifices. A *local (autochthonic) coagulation* may possibly result from previous embolism of the same region, supposing for instance that thrombosis spreads from the capillaries back to the large vessels. Since however all these phenomena are comparatively rare, we must regard *the transportation of clots from the veins (i.e. embolism) as the commonest cause of the plugging of the great arteries, that is met with in obstetrical practice.*

The thrombi liberated during the *lying-in state*, are derived from the large veins of the thighs or pelvis, more rarely from those of the uterus itself: on their way to the heart they probably increase by the addition of freshly clotted blood. Those on the other hand which are washed away *during labour*, are derived from the placental area, and here it is important to note that such cases as occur during, or immediately after, labour,

have almost always been preceded by hemorrhage; they therefore most often accompany partial separation of the placenta (whether normally or abnormally inserted), *e.g.* where premature labour is induced by a method which is apt to provoke such separation. The detachment of the placenta may give rise to an extensive formation of thrombi in the wide uterine veins, which formation is apt to advance centripetally, inasmuch as there is as yet no retraction of the uterus. If a strong contraction sets in (such as often accompanies the rupture of the membranes) at the end of the period of expulsion, the clots may easily be displaced in the direction of the trunk of the uterine veins, and pass to a greater or less extent into the circulation.

§ 781. The chief *symptoms*, which accompany plugging of the trunk or of one of the principal branches of the pulmonary artery are those of extreme asphyxia: intense dyspnoea with orthopnoea, gasping for air, an overpowering sense of terror, a weak, fluttering, rapid cardiac beat with corresponding pulse, a pale, livid face, and a gradually cooling skin. Death either ensues with lightning rapidity, or else the woman sinks collapsed, after struggling for a few minutes. If however it is not the main trunk that is affected, similar symptoms set in, although with less violence. The patient recovers by degrees, and in half an hour or an hour the most alarming symptoms subside; they may however, after the slightest exertion (*e.g.* after a rapid movement of the body) or even spontaneously, return and prove fatal, with, or without, an increase in the obstruction. Occasionally after one or several attacks, which are separated by a period of relief, convalescence sets in, followed by recovery associated with bronchitic symptoms. The obstructing clot is got rid of by a process of crumbling and absorption.

Where death is sudden, there can be no question of *treatment*. On the other hand the gravity of the occurrence and the knowledge we possess of its origin, render *prophylaxis* an important matter. This consists in ordering the most perfect rest to all pregnant, parturient and lying-in women, who have disease of the heart or blood-vessels. Even persons who, during the latter portion of pregnancy and during labour, have suffered from hemorrhage, ought to be strongly recommended never to leave their bed too soon. I need hardly add that a thrombosed vein

must not be manipulated, or even treated with strong liniments, for fear of loosening the clot.

Where a case of embolism does not rapidly terminate fatally, treatment consists in the use of stimulants (injections of ether, liquor ammoniac, wine, musk), of external counter-irritation by mustard poultices and liniments applied to the chest and limbs, and of warmth promoted by friction and warm towels, the hands and feet being bathed with warm water. Complete physical and mental repose must be maintained for entire days; when the urgent symptoms have passed, the use of opium has much to recommend it. Occasionally a venesection soon after the first attack (Lebert) has done good; so also has the local abstraction of blood from the cardiac region. Alkalies have been suggested with a view to causing the absorption of the thrombi (Richardson); but the advice rests purely on theory, and has not yet been confirmed by experience.

§ 782. *A woman, who has died during labour, ought invariably to be delivered.* Where the child is alive, this is directed by law (cf. § 269); but even when the child is dead, the same course should be followed, out of consideration both for the relatives and friends of the woman, and for the profession to which we belong, especially if the accoucheur has been in charge of the labour for some time, and has already made attempts at delivery. If the fœtus is alive, the conditions may be different from those that exist, where a woman dies in advanced pregnancy. For example, it may be possible to save the child by extracting it *per vias naturales*, indeed this may be the safer plan (e.g. where the head is low, or the trunk is already born); but if not, Cæsarian section should at once be performed. If the fœtus is already dead, it should be removed from the maternal body with the least possible injury to the latter.

LITERATURE.

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Entrance of air into the uterine veins: Olshausen, *Monatsschrift f. Geb.*, xxiv., p. 350; Kezmarszky, *Archiv f. Gynäkologie*, xiii., p. 200.

Embolism of the pulmonary artery: Hennig, *Deutsche Archiv f. Clin. Med.*, xv., p. 436 (this paper gives references to the literature of the subject).

8. *Death of the Child during Delivery.**Asphyxia Neonatorum.*

§ 788. The fœtus, as we know, can only live *in utero* by means of its connection with the placenta, or, in other words, by the interchange of gases and the absorption of nutrient matters which are rendered possible by that connection (§ 111). It dies, when the latter is broken or becomes inadequate. Interference with the absorption of nutrient fluids however, during the comparatively short period of labour, cannot be regarded as injurious, so that when death occurs during such labour, it must be attributed to an interference with the interchange of gases in the placenta taking place, before the fœtus (which is thereby roused from its apneic condition) can satisfy its want of oxygen, by obtaining such outside the uterus (*cf.* § 161). *Death therefore results from asphyxia*; only exceptionally is it caused by a sudden arrest of the heart's action.

The *ætiological factors*, which may lead to an interruption in the interchange of gases, and thus cause the fœtal blood to become lacking in oxygen (for this is the principal cause of death from asphyxia), are numerous. In the first place *the supply of oxygen by the maternal blood may be curtailed or checked*; *e.g.* after profuse hæmorrhage, with certain kinds of poisoning, with insufficient respiration (all of which conditions diminish the amount of oxygen in the mother's blood), or with a great fall of the maternal blood-pressure (Runge); moreover with unusually prolonged "pains", or with such as are only interrupted by very brief intervals (in this case the maternal placenta is too greatly, or too persistently emptied in the direction of the maternal blood channels, *cf.* § 161). Or else *the absorption of oxygen on the part of the fœtus may be impeded or prevented*. This happens, when the placenta is prematurely detached, or severely compressed (where the general internal uterine pressure no longer exists); also with pressure on the cord, and with arrest of the fœtal circulation through the placenta, in consequence of fœtal hæmorrhage (*e.g.* where an umbilical vessel has ruptured), or of persistent slowing of the cardiac action, due to pressure on the brain or compression of the thorax.

§ 784. Interruption of the apnœic condition of the fœtus, *i.e.* commencing asphyxia, has an irritating influence on its respiratory centre, and provokes respiratory movements; and this is true under all circumstances, during labour quite as much as while the child is making its exit from the parturient canal in the natural way. Furthermore these movements always produce the same effects: dilatation of the thoracic cavity, a flow of blood from the right side of the heart into the general area of the pulmonary vessels (which has been opened up in consequence of the dilatation), and an aspiration into the bronchi of the media which surround the respiratory orifices (unless of course these latter happen to be blocked). If now breathing takes place within the parturient canal, those media are not atmospheric air (only accidentally may some of this be accessible), but liquor amnii, mixed with vernix and often with meconium, secretions from the genital tract, and blood. The fall of pressure in the umbilical arteries, which occurs when the lungs of the fœtus are filled with blood, as well as the over-repletion of the venæ caviæ and of the umbilical vein, which is associated with the partial closure of the foramen ovale (this being a result of the filling of the left auricle) then lead to yet further interference with the placental interchange. At last, as no absorption of oxygen and no oxidation of the blood in the lung can take place, and as, owing to the continued inspiratory movements, the placental circulation (which even before this was inadequate) grows weaker and weaker, the irritability of the medulla oblongata is entirely extinguished; the respiratory movements and finally the cardiac activity (associated with paralysis of the accelerator cardiac nerves) then cease, and the fœtus perishes. If on the other hand the latter is born sufficiently quickly after the premature respiratory movements, before the last-mentioned results supervene, if it still shows more or less signs of vitality, it is said to be born in a state of *asphyxia*, or *suspended animation*.

The disturbance, produced by asphyxia and premature respiratory movements, may again subside, as Schultze (*l. c.* p. 138) has shown. The condition of intra-uterine apnœa may return, if the respiratory movements cease through exhaustion of the irritability of the medulla, and if, through fatigue of the constantly irritated vagus, the beat of the heart again becomes

frequent and the blood-pressure rises. Under such circumstances the normal blood-pressure in the descending aorta and in the umbilical arteries may again rise, the placental vascular system fill more and more (the suction of blood to the lungs being arrested), and the placental respiration be once again set going. But all this is only possible, when the disturbing agent itself only acts temporarily, as for instance when pressure on the cord lasts but a short time.

§ 785. The important bearing, which premature respiratory movements have on the question of intra-uterine suffocation, and on its diagnosis in the still-born child, suggests the problem, whether death may occur during labour without such intra-uterine breathing, either through asphyxia or through some other cause.

The latter can only consist in the sudden arrest of the cardiac activity, which arrest must be due to such pressure on the brain as will powerfully stimulate the vagus. This mode of death, although rare, has actually been observed. The pressure in question may be derived from the compression to which the skull is subjected by a contracted pelvis, from the forceps, from a difficult extraction in a pelvic presentation¹, or from an extravasation at the base of the skull, and may kill the fetus, while still in a completely apnoic state. On the other hand the death of the fetus may be preceded by respiratory movements due to some cause or other, possibly even to the placental interchange of gases being diminished, in consequence of the irritation of the vagus.

On the other hand *asphyxia without intra-uterine respiration* is possible, firstly where the respiratory centre has been damaged by apoplexy, during the development of such asphyxia. The injury then prevents the imperfectly oxygenated blood (whether this condition is produced by one of the ordinary impediments to the placental circulation, or by the same extravasation, which destroyed the respiratory centre, interfering with the heart's action) from irritating the centre, and liberating inspirations, just as it sometimes does after birth, where a child is expelled in an all but living (*lebensfrisch*) condition, of which I, as doubtless others also, have seen plenty of examples; for instance after certain forceps operations, or after rapid extraction through strong pulling at the shoulders in pelvic presentations.

¹ (J. Dohrn, *Archiv f. Gynaekologie*, vi., p. 366.

A further cause of delay in the commencement of respiratory movements lies in the *prematurity of a labour*. With premature fetuses the thoracic parietes have still too little firmness; the respiratory muscles have as yet but little functional power, and even the nerve centres are not sufficiently developed to respond by respirations, when the supply of oxygen to the blood falls short. Indeed we see that in all premature, although in other respects vigorous, new-born children, respiration begins slowly, the more slowly, the younger they are. Moreover it is extremely probable that such fetuses have less respiratory requirements¹.

A few exceptional cases will remain, of children who have died during delivery, or who have been born in a state of suspended animation, but in whom no signs of premature respiratory movements are discoverable; of course children, who have just been born, and who, owing to an unusual prolongation of the natural condition of apnoea, do not begin to breathe for a considerable time, must not be mistaken for cases of suspended animation. In regard to such rare exceptions, Schultze has shown reasons for thinking that *death from asphyxia may occur without intra-uterine breathing*, where the interference with placental respiration begins very gradually, and where the impoverishment in oxygen increases so slowly, that at its commencement it does not as yet act as an irritant upon the respiratory centre. By the time that it begins to do this, the irritability of that centre may have been so much weakened, that even the increased impoverishment no longer acts as a stimulus to respiration. In this way the irritability of the centre may possibly be wholly destroyed, and the fetus pass out of its state of apnoea into one of asphyxia, without the occurrence of respiratory movements.

The same author has also suggested that, conversely, a mechanical irritation of a hitherto apnoeic fetus (by the forceps, or the hand during version) may sometimes cause premature respiratory movements, and in this way indirectly lead to interference with placental respiration. Schwartz denies that this *intra-uterine respiration occurs without intra-uterine asphyxia*,

¹ Litzmann (*Archiv f. Gynakologie*, ii., p. 211), agreeing in this matter with Schwartz, states that the results of Cæsarian sections performed *post mortem*, are more favourable, the further the fetuses are removed from the normal period of maturity, provided of course that they are viable.

and only admits the action of the cutaneous stimulants for cases in which there is already a *besoin de respirer* (*Archiv f. Gynæcologie*, i., p. 365, 377).

Post-mortem Appearances.

§ 786. The necropsy of children, born dead or dying (excepting those rare cases in which death took place from some other cause than asphyxia), yields the characteristic signs of asphyxia, to which are usually added those due to the aspiration of foreign substances, and to death by drowning. The principal signs of asphyxia are a dark, fluid condition of the blood, and great engorgement of the branches of the pulmonary artery, this being all the greater, the less of other media the lungs were able to suck in, during the expansion of the thorax which accompanied inspiration. The lungs are of a dark colour, heavy, somewhat enlarged, and, when incised, overflow with blood, and almost always present more or less numerous subpleural ecchymoses (the so-called ecchymoses of Bayard, or Tardieu's spots¹). The latter are one of the severest results of the aspiratory action of the thoracic walls, and their almost constant occurrence is caused by the fragility of the foetal vessels, which so greatly predisposes to extravasations of blood, even where the alterations in pressure are only very slight². These extravasations however may be absent, if the inspirations were weak and of short duration, or if the thorax was unable to expand fully. Under such circumstances too the lungs will contain but little blood, and, on making an incision, blood will only exude from the larger branches of the pulmonary artery; the latter condition however is never absent. Again, there are sometimes numerous ecchymoses beneath other serous membranes, e.g. the costal pleura, the peri- and endocardium; and at such times (as also in other forms of asphyxia) venous stases, caused by the engorgement of the lungs, occur in more distant organs also, in the right side of the heart, in the large vessels, the abdominal organs, the brain and its membranes; there may be epi- and subpericranial extravasations of blood, the

¹ Cf. Lukomsky, "Tardieu's Flecke bei Erstickung," *Vierteljahrsschrift f. Gerichtl. u. Medicin*, xv., 1871, p. 58.

² Rhoder (*ibidem*, xxii., 1880, p. 286) believes that the ecchymoses mainly arise from the increased blood-pressure, the latter being a result of the irritation of the vaso-motor centre, which accompanies asphyxia, i.e. of the energetic contraction of the arteries.

latter being both external to, and beneath, the dura mater; sub-conjunctival ecchymoses are also now and then met with. The occasional absence of this condition of hyperæmia, in spite of extreme asphyxia, may possibly be explained, by the flow of blood to the body of the fœtus having been prevented by a compression of the umbilical cord (Scanzoni).

When death has occurred by drowning, aspirated substances will be found in the air passages (*cf.* § 784), except of course when the face of the fœtus happened to be covered by the wall of the parturient canal or by the membranes; a small quantity of thin, clear liquor amnii may however be overlooked, if distributed as a uniform, thin layer throughout the air passages. The quantity and distribution of the aspirated substances depend on the energy of the respiratory movements, and on their own composition. Liquor amnii, with the easily recognisable particles of vernix caseosa, frequently coloured greenish brown through admixture with meconium, and with some woolly hairs, may be found even in the minute ramifications of the bronchi; if the lungs are squeezed, the fluid will be found to ascend from the deeper parts, while on a cut surface these substances will appear as yellowish or greenish plugs in the small bronchi. Tenacious mucus from the genitals, with, or without, blood and meconium, is usually only found in the large bronchi, the trachea, and the larynx; sometimes it is only the entrance to the latter which is blocked by masses of mucus. If the uterus contained air during the inspiratory movements, or if the air was directly conducted by the hand to the fœtus lying in the pelvis, some portions of the lung may be found inflated; again, air may be swallowed or aspirated during premature breathing (Kehrer, *l. c.*), and in that case be discovered in the stomach and duodenum. Great, especially forensic, interest attaches to the cases in which (as Wendt has proved) liquor amnii passes into the cartilaginous Eustachian tubes (in consequence of their dilatation, which accompanies the first inspirations), and through them into the middle ear (*i.e.* the tympanic cavity), whose gelatinous and swollen mucons membrane moreover presents great venous hyperæmia.

I must not omit to mention that the intestine of the fœtus may be devoid of meconium, or only contain such in its lower portion. The evacuation is due to the peristaltic movements,

which are caused by the carbonic acid poisoning, and to the activity of the abdominal muscles during the inspiratory movements.

Diagnosis.

§ 787. *The life of a child may be diagnosed to be imperilled during labour, if the accoucheur discovers the condition (which in most cases is accessible to diagnosis) causing such danger, together with the objective changes in the manifestations of foetal life.*

The diagnosis is easy, *when the child is partly born*, whether with its head or with the lower half of its body, for the presence of asphyxia will then be revealed by the laboured inspiratory movements; indeed these may sometimes actually be heard, inasmuch as air usually has access to the face. The accoucheur may estimate the degree of urgency by the same means, as well as by directly feeling the child's pulse, and noticing the more or less flabby condition of the portion of body which is expelled.

He will however rarely be able to directly make out inspirations, *while the fetus is still in utero*. But he might possibly be able to do so, when introducing his hand into the uterus, either for the purpose of operating or exploring. Schultze indeed, by applying his ear, actually succeeded in hearing the inspiratory murmur, and in some cases, in which air has been conducted to the respiratory orifices, this has given rise to a cry which could be heard by the by-standers, called the *ragitus uterinus*. This foetal cry for help has been heard sufficiently often, to leave no room for doubt as to its occurrence, although there may be many a myth amongst the stories that used to be related on the subject. I have heard it quite loud on two occasions; once during a difficult version, the other time with a presenting head, while I, after introducing my whole hand, was examining the relations of the head to the pelvis, before undertaking craniotomy. Nowadays the cry has no longer anything specially wonderful about it, nor has the aspiration of air any special significance as regards the mechanism of intra-uterine asphyxia. Only from a forensic point of view does such significance attach to it.

§ 788. In the great majority of cases, the *slowing of the foetal pulse* is the first, the *discharge of meconium* the second sign

which points to the approach of danger. The retardation of the pulse-rate however only does this, when it continues during the interval between the "pains", and persists; a retardation which disappears immediately and completely when a pain subsides, is an almost invariable occurrence (cf. § 119), as soon as strong contractions have set in, and especially as soon as a portion of the ovum has quitted the uterine cavity. It depends, not on irritation of the vagus by imperfectly oxygenated blood, but on the mechanical action of the pressure of labour, on an increase of the general intra-uterine pressure, on some pressure which mainly involves the thorax of the fetus, and perhaps on the blood in the fetal portion of the placenta being squeezed out towards the fetus. Only rarely can it be due to cerebral pressure, since the effects of the latter would not so speedily disappear during the intermissions. If, on the other hand, the pulse-rate does not regain its previous frequency during the intermission, or if the rate gets slower and slower, there must be a very severe and dangerous degree of pressure on the brain at work, or else, and this is commoner, the blood has already become so venous, that it irritates the origin of the vagus. In such a case however the respiratory centre must also be stimulated, since this is quite as sensitive to venous blood, as are the roots of the vagi.

Occasionally however a not inconsiderable slowing of the pulse, persisting during the interval between the pains, is observed to pass off after a time, without doing any harm; indeed even premature respiratory movements may, as already mentioned, again subside. The explanation doubtless lies in the fact that a diminution in the pulse-rate, that only lasts a short time, may be caused by a likewise brief, although severe, compression of the body and especially of the skull of the fetus. But a *prolonged* fall in the rate is always an ominous sign, all the worse when followed by a rapid acceleration; for this phenomenon, which is by no means rare, indicates (as Schultze has shown) that there is commencing paralysis of the vagus, and therefore is usually before long followed by death.

The *discharge of meconium* has of course no importance, if it occurs where the lower end of the trunk is in the pelvis, or is already making its exit, for under these circumstances the intestinal contents are squeezed out mechanically by the great pressure of labour. In all other cases, the discharge accompanies

asphyxia, more particularly the first stages of the latter, in which as yet no paralysis is present. This is proved by the frequent occurrence of meconium in liquor amnii that has been aspirated, under circumstances in which the premature inspiratory efforts were not very violent, and the delivered child only appears moderately asphyxiated.

§ 789. A new-born child is said to be in a state of *suspended animation*, when, as already mentioned, it is so exceedingly drowsy, in consequence of non-oxygenation of its blood or of cerebral pressure, that, apart from contractions of the heart, it presents no manifestations of life, or only such as are feeble and separated by long intervals. This condition must not be confused with one of *extremely low vitality*, which is sometimes met with in premature and badly nourished, flagging children, in whom (since immediately after delivery the *besoin de respirer* is but slight) respiration comes slowly into action, remains sluggish and shallow, and before long is entirely extinguished. Nor again must it be confused with those cases in which the *fœtal apnœa* is *unusually prolonged*, such as are sometimes met with where fœtuses make their exit soon after the rupture of the membranes, and with the expenditure of but little expulsive force. This condition of prolonged apnœa is probably most marked in children that have rapidly been removed through Cæsarian section, before the escape of the amniotic fluid, and without further disturbance; in such the heart's action is vigorous and of the usual fœtal frequency, and after a minute or at most a minute and a half the new-born child cries freely and lustily.

I must also mention here that sometimes *respiration is mechanically hindered after labour*, and does not come into operation, although there was no sign whatever of asphyxia *in utero*. This for instance may happen, where the trachea is compressed by a goitre (*cf.* § 388), where the thorax is distended, and the lungs pressed upon by a bilateral pleuritic effusion, of which I have seen a well marked example¹. Again, I know of

¹ Premature labour occurred in the 35th week, there being much liquor amnii, the bag of membranes descended into the vulva, and was then ruptured. Delivery took place 20 minutes later, accompanied by the minimum expenditure of expulsive force: the pulse of the fœtus remained unaffected till the exit. The child presented some apnœa and a highly distended abdomen and thorax: the heart at first was acting well, but soon ceased, after a few laborious and ineffectual respiratory movements had

two instances, in which breathing was rendered impossible, by the destruction of the respiratory centre, through hæmorrhage into the medulla oblongata and the cervical spinal cord. This hæmorrhage was a result of pressure and traction on the cervical vertebrae, accompanying extraction (by means of the forceps or the hand) of the after-coming head; although the heart was still beating vigorously, no act of breathing took place, either spontaneously or after stimulation of the skin, or after artificial respiration. The history of such cases can only be cleared up at the necropsy, but they are in no way connected with intra-uterine asphyxia.

Symptoms.

§ 790. The asphyxia of new-born children *varies greatly in severity*, but for practical purposes we may, as Schultze and Cazeaux have done, distinguish *two varieties*, whose boundary line lies at the point at which the muscles lose their tonus, and the child is relaxed like a fresh corpse.

The *first degree* is characterised by the retention of muscular tonicity, and its description corresponds with that of apoplectic asphyxia, the *asphyxia livida* of earlier writers. The skin is cyanosed and turgid, the eyeballs are injected and often prominent; the heart's action is usually vigorous, although sometimes considerably slowed, the pulse wave is high, the umbilical vessels are greatly distended. The limbs of the child are adducted, and movements can easily be provoked by mechanical irritation; especially is this true of the muscles of the jaw. At first there are no respiratory movements, but these not uncommonly soon commence spontaneously, a result of the gradual diminution in oxygen, which continues after delivery, and which then acts as a still more powerful stimulus to the medulla; these movements at the outset are shallow and associated with contortions of the face, but by degrees they get deeper, and are accompanied by cries. As a rule they may rapidly be provoked, if the skin of the child is stimulated. Occasionally as the first inspirations are beginning, the mucus in the pharynx is drawn over, and into, the glottis, and

taken place. The necropsy revealed a considerable serous effusion into both pleural cavities, the lungs being pressed close upon the vertebral column, and containing neither air nor blood. The aortic orifice was narrowed, only two aortic valves being present the membranous part of the interventricular septum was absent.

leads to severe respiratory spasms and fits of coughing; indeed it may considerably interfere with the regular development of breathing.

Cases of the *second degree* present all the characteristics of the so-called anæmic or pale asphyxia, *asphyxia pallida*. The new-born child looks pale and flabby, and soon grows cool; the conjunctiva loses its lustre. The muscles are relaxed and non-irritable, and the lower jaw and limbs hang down; if the child is raised, its head sinks unsupported to one side. The maxillary muscles do not react, if the finger is introduced into the mouth; the anus is open. The heart beats feebly, but sometimes much oftener than in cases of the first degree (pneumogastric exhaustion); the umbilical vessels are almost empty, the pulse in them being absent, or, if present, almost imperceptible. Inspiratory movements here are common immediately after labour, but they are mere gasps, the facial muscles remaining unaffected. It is almost only the diaphragm that acts (the ends of the ribs are drawn in); rarely are the ribs thoroughly well raised; rales are generally absent. Inasmuch as the inspirations convey no, or only very little, oxygen to the blood (indeed the air passages are usually full of substances that have been sucked in), the irritability of the medulla grows less and less, and at last death follows. The child will have the best chance of reviving, if the aspirated matters are small in quantity, or if they can be removed or displaced at the same time that air gets into the lungs. Restoration is most difficult, when free inspiration occurred at a time when the mouth and nose were obstructed, and when the expansion of the thorax was only balanced through an aspiration of blood. The return of the muscular tonus, and the refilling of the cutaneous blood-vessels are signs of commencing resuscitation.

§ 791. The *prognosis* therefore is favourable, when the intra-uterine danger has lasted but a short time, and when only the first degree of asphyxia has developed; even then however recovery is always doubtful, since we have no means of detecting the changes in the tissues of the medulla, brain and thoracic organs. The prognosis is far more uncertain in cases of the second degree. Even if the child is again resuscitated, its further thriving depends largely on whether the aspirated masses lead to atelectasis and lobular pneumonia, and on whether any intra-cranial

extravasations are present or not. The latter are on the whole well tolerated by new-born children; still it is possible that they may materially affect the subsequent development, especially from a mental point of view¹.

Treatment.

§ 792. It is obviously the duty of every accoucheur to do his best to prevent the foetus from dying during delivery, or being born asphyxiated. At any rate he must seek to shorten the duration of asphyxia by accelerating delivery, as far as this can legitimately be done, without involving special risk to the mother. The safety of the latter however is not the question before us; here we are solely concerned with the treatment of asphyxia neonatorum.

The preceding discussion must have made it clear that the one aim of treatment is to induce the *fœtus* to breathe regularly. This is the only remedy for the want of oxygen and the co-existing carbonic acid poisoning; this alone can restore to their normal level the depressed functions of the medulla oblongata and the enfeebled circulation. The immediate solution of this problem however is usually hindered by the presence in the air passages of inhaled substances. Their removal therefore claims priority, and constitutes a second indication for treatment.

In the first degree of suspended animation, cutaneous stimulation (flagellation of the nates, friction of, and blowing air upon, the body, splashing it with cold water, the introduction of lots of ice into the rectum) suffices to excite the not excessively dormant respiratory centre in the medulla, and to provoke inspirations. With each breath that is drawn, a gradual improvement takes place in the condition of the blood, in the circulatory relations within the thorax, and in the irritability of the medulla. As a preliminary step however, the practitioner must remove any substances that have been inhaled, and have accumulated in the upper portions of the air passages, and he may usually succeed in doing this, by repeatedly introducing his finger into the mouth and pharynx of the child and laying the latter on its abdominal aspect, by which pressure the foreign matters are encouraged to run out; and vigorous expiratory movements are provoked. If

¹ Cf. Little's "Greatest Transfusion," p. 32. *British Medical Journal*, July 12, 1902 and May, 1903. *Lancet*, 1903. *Transactions of the Society of Obstetricians*, vol. 3, 204.

those substances are very tenacious and firmly adherent, or if they are obviously blocking the entrance to the larynx, he may suck them up with an elastic catheter and remove them in this way. The stimulus caused by this act is sometimes in itself sufficient to induce respiration. It is quite unnecessary to *catheterise the trachea* in the first degree of asphyxia, judging at least from my experience; and an additional reason for avoiding such a measure lies in the fact that in inexperienced hands the necessary manipulations about the epiglottis, and the movements of the instrument in the larynx are of themselves apt to cause undesirable irritation. I have often noticed hoarseness and distressing fits of cough persist for some days after the use of this method.

The practice of *ligaturing and dividing the cord* before the commencement of artificial respiration is unquestionably a bad one, if the placenta is still *in utero*. It involves the loss to the child of the surplus blood, which it ought to receive at the time the placenta is expressed (*cf.* Vol. i., pp. 262-3). Even when the latter is already in the vagina or actually expelled, the cord should not be divided, until breathing is in full swing, since inspiration accelerates the afflux of the blood from the umbilical vein, and makes room for it in the lungs, and since a thrombus which has formed, in consequence of premature ligature of the cord, might possibly be sucked into the heart with the first strong inspiratory movement.

§ 798. If the new-born child is suffering from the *pallid variety of suspended animation* (asphyxia pallida), any foreign substances in the pharynx and trachea should first of all be removed by means of the finger and catheter. *Cutaneous stimulation* however is *of no use* here; indeed it is, if anything, injurious, since on the one hand it does not provoke respiratory movements, while on the other the accelerated cardiac action sends all the more non-oxygenated blood to the medulla oblongata, and thus rapidly leads to its complete exhaustion. Such stimulation should be postponed, until the condition of the blood has improved.

In these cases of extreme asphyxia, *artificial respiration* should be commenced without a moment's delay. Since this however cannot conveniently be done, while the child is lying between the thighs of its mother, it should (as soon as the nearest

aspirated substances have been got rid of) be removed from there, its umbilical cord having of course been ligatured and divided.

Artificial respiration ought to resemble the mechanism of natural respiration as closely as possible. The operator must therefore alternately and rhythmically expand and contract the thorax of the child, by directly acting on its parietes, and in this way promoting the interchange of gases in the lungs. The same means will serve to restore to the normal level the difference between the arterial and venous blood-pressure, this being a necessary condition, if the circulation is to grow sufficiently active to maintain a satisfactory exchange of gases in the lungs, and to carry its results to the medulla. Another object of artificial respiration is to get rid of the substances that have been sucked deeply into the chest.

These requirements are only satisfied by the method of Schultze, and by that of Marshall Hall, which I use myself. True, many practitioners still prefer the insufflation of air through a catheter introduced into the trachea, probably because when once the catheter has been introduced, it can so easily be used for also sucking out any substances, that are lying in the air passages. But this is not sufficient to demonstrate the value of the method, even if we admit that its practice does not on the whole appear to be dangerous. Not only is insufflation liable to drive the aspirated masses still further into the small bronchial tubes, and, owing to the use of undue force, to cause interstitial and subpleural emphysema (which as a matter of fact I have more than once seen, and which others too have recorded), but it also permanently increases the pressure within the whole thorax to an injurious extent, and leads to excessive expansion of the chest. In consequence of this, the due equilibrium of in- and expiratory efforts is not secured, even when expiration is afterwards imitated. Insufflation undoubtedly increases the flow of blood to the heart, and accelerates its contractions, and thus may well exert a temporary stimulating influence on the circulation, all the more so, as the small quantity of blood which is in the lungs, gets oxydised through contact with the insufflated air, and after returning to the heart, flows on to the medulla. But even with the second insufflation this effect grows less marked, since, owing to the already existing distention of the lungs with air, only a slight quantity of blood is forced onwards to the heart. Indeed

it is not infrequently actually observed, that, even when the first insufflation has led to inspiration, the following ones do so no longer. A regular change in the air, such as accompanies spontaneous respiration, or an alteration in the intra-thoracic pressure like that associated with such respiration, is therefore not attained with insufflation, as it is with the two other methods that have been mentioned. For this reason I can only recommend these last. The *one exception*, as Schultze rightly points out, to this conclusion, occurs, when the thorax of a new-born child is soft, and allows all the changes of form, which are produced by those two methods, to take place, without itself gaining in capacity. Under such circumstances alone can insufflation be of any use.

§ 794. According to Marshall Hall's method (called by its author¹ the "ready method"), which is especially valuable in cases of asphyxia due to drowning, the respiratory movements of the thorax are directly produced by the weight of the body, and by the resiliency of the thoracic walls. When the child is placed on its abdominal surface, the thorax is compressed by the weight of the body (movement of expiration), while, when the lateral posture is resumed and the pressure is therefore removed, the thoracic wall is raised, and a movement of inspiration results. The accoucheur can assist the expiratory stage, by pressing the sides of the thorax with his hand. One great advantage of this method lies in the fact that it starts with an expiratory movement, and that the latter always occurs in the prone position. The tongue therefore falls forwards, draws the epiglottis, which covers the entrance to the larynx, away from it, and thus opens a way to the glottis for the air that enters with the inspiratory movement. Again, the prone position not only allows, but facilitates, the exit from the larynx, pharynx, mouth and nose of any foreign contents of the respiratory tract that have been driven upwards. This effect of the prone position is of great importance, and its value has been recognised for many years by numerous writers². Even if only little air enters the lung with each expansion of the thorax, yet this little suffices

¹ *Prone and postural respiration in drowning and other forms of apnoea or suspended respiration*. London, 1857.

² The method recommended by Silvester (*The physiological method of inducing respiration*, 3rd ed. London, 1863) and lately again by others (*l. c.*, 1866) consists in the alternate strong abduction and adduction of the upper limbs with a view to

for the time being, and every subsequent expiratory movement forces the aspirated substances further upwards. They thus get looser and more movable, and are more and more completely replaced by the entering air.

In order to prevent the new-born child from getting chilled, these movements may be combined with baths, cutaneous stimulation being also employed from time to time. The following is the *modus operandi*. The aspirated masses having first of all been removed from the pharynx, or sucked out of the trachea, the cord is tied and divided, after which the child is placed in a warm bath for a few seconds. It is then wrapped in a warmed cloth, and laid on its abdominal aspect, in such a way that one of its arms lies under the forehead or against (in front of) the neck; if the mouth of the child is obstructed by the underlying sheet, the operator should slightly raise its occiput with his fingers. After a few seconds the child is turned on to its side, and then back on to its stomach. As a rule when the lateral posture is assumed, a gasping inspiratory movement results, and this is to be instantaneously followed by the prone position. In the latter the back and the sides of the thorax are gently compressed upwards, and together with the lower limbs are vigorously rubbed. But the child must never lie on its stomach for long; the lateral posture must again be resumed, and preferably the opposite one to that which was last used. When this to and fro movement has been continued for about half a minute, another bath should be given, and, if necessary, cold water may be poured over the child while in the bath, or friction applied. These measures must be persevered with, until respiration is in full swing, and until deep rattling shows that even the substances, which had collected in the smallest passages, no longer obstruct the entrance of air.

§ 795. *Schultze's method* acts even more rapidly, owing to the fact that it does not merely depend on the, under certain circumstances, very slight elasticity of the thorax, but brings additional factors into play, which are still more efficient in expanding and contracting the chest. On account of its importance therefore, I

alternately enlarging and contracting the thoracic cavity. But it cannot take the place of Marshall Hall's proceeding, since the movements are carried out in the *dorsal posture*, and this hinders the exit of the inhaled fluids. Silvester's method undoubtedly causes a very considerable expansion of the thorax, but this, as already stated, is quite unnecessary.

with quote the author's own description. As soon as the child has been separated from its mother, it is seized by the shoulders in such a manner that the operator's thumbs rest one on each side against the anterior wall of the thorax, while his index fingers pass from the bottom into the axilla, his other fingers lying transversely across the back. The child is now allowed to hang down loosely at arm's length, the operator holding it in front of, and between, his straddled legs. He now, keeping his arms straight, proceeds at once to swing the child upwards, so that its head points downwards: its pelvis, through flexion of the lumbar vertebral column, slowly falls over towards the abdominal surface, with the result that the whole weight of the child falls on the thumbs lying on its thorax. The compression of the contents of the thorax, which is thus produced by the diaphragm and thoracic walls, now causes a powerful expiratory movement, during which any aspirated substances run out. At this moment the child is again swung downwards between the separated legs of the operator; by this means its body is extended, and the thorax, being released from pressure, expands. Since moreover the body now hangs by the upper limbs, and the sternal ends of the ribs are thus fixed, the weight of the child is used for raising the ribs: owing to the swing which acts on the contents of the abdominal cavity, the diaphragm also moves downwards, so that an extensive inspiration follows.

This swinging movement is to be repeated 8—10 times, at intervals of several seconds, when the child is immersed in a warm bath, so as to avoid undue cooling of its skin and to enable the accoucheur to watch the effect of the artificial respiration. If there are now rhythmical, even though quite shallow, respiratory movements, as well as other signs of returning irritability, this latter, *ec.* the functional activity of the medulla, must be increased by stronger stimuli, the best of which is dipping the child into cold water. If there are no respiratory movements, or if the only ones are of a dyspnoic character, the swinging &c. must be resumed, until at last either the child cries, or the heart's action entirely ceases. If, after reviving for a time, the child relapses into a state of dyspnoea, the swinging movements and the application of cold may again be resorted to. I have already mentioned that, where neither Marshall Hall's nor Schultze's methods cause air to enter the lungs, insufflation may be tried.

§ 796. Resuscitation cannot be regarded as complete, until there has been prolonged, loud crying. The efforts to bring this about, whatever method has been adopted, should therefore be continued, until the respiratory movements have become sufficiently vigorous and deep. This is the best way of avoiding the sequelæ, viz. atelectases, bronchitis, pneumonia, which so often prove fatal. The treatment however must always be quiet and deliberate, never rough and hurried, the various measures being tried in a certain ascending order. Nor should the worst cases be immediately despaired of. For even if the beneficial result is not permanent, a temporary resuscitation gives some satisfaction to the child's relatives; at any rate it shows them that medical skill has done its best.

A child, that has been restored, must be closely watched during the next few days; it must be kept warm and regularly fed. If the air passages are very full of secretion, a rapidly operative emetic, administered soon after the resuscitation, may be useful (Kleinwächter).

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CHAPTER III.—THE PATHOLOGY OF THE PUERPERAL STATE.

§ 797. By puerperal diseases are meant those, and only those, diseases, which stand in some ætiological relation to the changes accompanying pregnancy and labour. A large proportion of these diseases (whether they be modifications of pre-existing affections, produced by the reciprocal influence of such affections and the general as well as local puerperal phenomena one upon another, or whether they be fresh pathological conditions provoked by such phenomena) has already been described in previous chapters, for the simple reason that they show themselves at a time preceding the post-partum state; moreover with a view to avoiding repetition, their relation to that state was also referred to.

Amongst the remaining disorders, on the other hand, which bear a direct relation to the last stages of delivery, and only arise during the latter, there are many that have a comparatively slight influence on the progress of the lying-in period: they disturb this but little, and only assume their full importance at a subsequent period (for instance tears and perforations of the parturient canal, and displacements), so that their complete discussion belongs to special works on Gynecology. Here therefore I have merely to describe those diseases, which wholly or mainly belong to the post-partum state, and these are: anomalous involution of the generative organs (including some affections of the neighbouring parts), anomalies of lactation, psychical disorders, and the puerperal traumatic diseases.

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1. *Anomalous Involution.*

§ 798. The remarks, which have been made under Physiology of the Puerperal State, in reference to the nature and symptoms of involution of the uterus (for this is of course the principal organ concerned), will have shown that the only conditions, which we can regard as morbid, are : a too slowly progressive diminution in size, anomalies in the lochia, and anomalies in the formation of thrombi at the placental area. The sources of such disorders are numerous, although not always quite easy to detect. In rare cases they must be sought for outside the uterus, but almost always they lie inside ; they frequently depend on the course of the previous labour, although sometimes the phenomena are due to inflammation of some injured spot. Nor must it be forgotten that the original disposition may derive fresh strength, from the immediate sequelæ of a primarily slight delay in the involution, in which case the sequelæ act as a further causal agent. In view therefore of this reciprocal influence and co-operation of cause and effect, it will be best to study each of the principal phenomena of disordered involution independently. The most important amongst them are hæmorrhage and thrombosis ; anomalous after-pains and lochia mainly retain the position of symptoms.

a. *Anomalous After-pains.*

§ 799. *The after-pains may be abnormal in one of two respects : they may last beyond the first few days, or they may be unduly painful.* Both conditions are as a rule connected with one another, and indeed generally arise from the same cause, viz. distention of the cavity of the uterus by remnants of the ovum, lochial secretions, and above all by blood clots. Under such circumstances the uterus is found comparatively large, and, when pressed, contracts with abnormal distinctness ; moreover not infrequently there are painful sympathetic sensations in the neighbouring organs, especially in one or in both thighs. At first fever is absent, but it shows itself, as soon as the contents of the uterus begin to decompose, or provoke inflammation of its wall. This form of the disorder, namely that due to retained masses,

mainly attacks multiparae, in consequence of the slower progress of involution in them; occasionally too it follows the artificial removal of the placenta. The diagnosis will be easy, if the practitioner bears in mind, that in this condition the uterus is only painful during its contractions, that the latter can be induced by the pressure of his hand, while no sensitiveness to pressure exists during the intervals between the paroxysms. The primary indications for treatment are the removal of the retained masses, and irrigations of the uterine cavity with a warm 2 p. c. carbolic lotion. If these indications are satisfied, the normal condition of health rapidly returns. Warm fomentations applied to the abdomen, preparations of ergot, a laxative, followed by an opiate, assist the involution.

Occasionally metritis or perimetritis begins with the appearance of very painful and frequent after-pains, which in such a case must be a result of the inflamed condition of the uterine muscle; but the objective sensitiveness to pressure and the co-existence of fever from the outset distinguish this variety from the first. Disinfecting, warm irrigations, poultices, fomentations of turpentine, and purgatives (especially calomel) will be found most useful.

Anomalous after-pains are only in exceptional cases observed without some detectable physical change in, or about, the uterus, if it is not forgotten that in multiparae contractions are not infrequently provoked during the whole of the first week by suckling, in which case they are physiological phenomena. I have never met with a case of neuralgia of the puerperal uterus, such as some (especially English) authors describe; but I have occasionally seen a disordered state of the stomach and bowels (probably due to cold or overloading of the digestive tract), in which the uterus participated, as was shown by a few, although very painful, contractions. A thorough evacuation of the bowels by castor oil or turpentine, if necessary in the form of enemata (containing one table-spoonful of each drug), fomentations of turpentine, small doses of narcotics, and low diet will soon restore the woman to health.

b. Anomalies in the Lochial Secretion.

§ 800. The quantity and character of the lochia vary, as we know, with the condition of the lying-in woman, and especially with that of her generative organs, so that a tolerably safe con-

clusion, as regards the condition of the inner surface of the uterus, may be based on the condition and character of the flow. *A very copious secretion* invariably points to a slow involution of the uterus, and not uncommonly to the presence in the latter of retained substances. The same cause may render the lochia *very offensive*, since putrefactive germs can easily and in various ways reach the cavity of the uterus. Sometimes again the secretion is offensive, simply because it stagnates in the vagina, *i.e.* in the *cul de sac* which the posterior wall forms above the perineum. In yet other cases the offensiveness arises from a sloughing condition of the inner wall of the uterus, so that this character of the lochia may result from very various conditions. Which is the true cause in any particular instance will not be difficult to determine. It is of the utmost importance, both from a prophylactic and a curative point of view, that all retained substances be entirely got rid of, and that the use of disinfectants be persevered with.

The lochia are of course never entirely absent. The quantity however, even from the first, may be very slight, consistently with perfect health, and last but a very short time, as for instance where the decidua has been very smoothly detached at the time of delivery, and when the skin and bowels are acting freely, and thus diminish the transudation from the uterine mucosa. *Sudden arrest of the discharge, when of short duration*, not infrequently precedes inflammation of the inner surface of the uterus, and is soon followed by a more copious and usually most offensive discharge; the whole aggregate of symptoms will then indicate the nature of the case. *A more prolonged absence of flow*, without marked alteration in the state of health, is always due to some mechanical obstruction, *e.g.* to flexion of the organ (sometimes forwards, more rarely backwards), or to fragments of the ovum or clots blocking up the os uteri. The lochia then accumulate in the uterus (*lochiometra*), which feels large, and reacts by means of severe after-pains; if the contents undergo decomposition, fever will follow, and once or twice I have seen rigors caused by the stagnation. If the uterus is straightened by means of the hand, or if a tube is passed in, and the uterine cavity irrigated, the free escape of the lochia will again be made possible, and this will soon restore the woman to her normal condition. But *lochiometra* may recur more than once.

c. Hæmorrhage from the Uterus.

§ 801. The hæmorrhage, which occurs immediately after delivery, has been described in the previous chapter, so that we have here merely to consider that variety, which sets in at a later period of the post-partum state, and which is called *secondary hæmorrhage* (cf. § 680). These attacks are generally due to the same causes as is placental hæmorrhage (of attacks of bleeding caused by inversion, new formations, and laceration, we have already spoken under the proper headings), i.e. to insufficient contraction (retraction) of the uterus, and to an irregular formation of thrombi; the blood must therefore be *mainly derived from the placental site*, but only mainly, since in consequence of the wounded condition of the whole inner surface of the uterus, hæmorrhage from the *extra-placental* portions is also possible. The fact that the retrograde changes in the organ are steadily progressive, explains why recurrent hæmorrhage grows rarer and less serious, with every day that elapses. Indeed as a matter of fact it is extremely rare for the loss to be so copious at any one moment as to be dangerous; it only becomes so on account of its duration. There are exceptions however to these statements: for instance M'Clintock (*l.c.*) refers to 6 fatal cases, and Bassett¹ met with 2 such out of a total of 13; all the cases of the kind which I have met with recovered, although several suffered severely.

Of the two principal causes, i.e. insufficient retraction of the uterus and imperfect thrombosis, the latter is of least importance, since even in the normal condition the thrombi only fill the openings of the blood-vessels, the veins and arteries in the tissues themselves being empty, in consequence of the inactivity of the uterus, whose supply of blood (as with most other organs) is determined by its functional activity. The slight influence of the thrombi in securing the permanent arrest of hæmorrhage during the post-partum state, is further shown by our experience that in purulent endometritis they may be completely softened, without this leading to any considerable hæmorrhage. When on the other hand the uterine retraction is prevented by retained masses, especially when the retraction of the placental site is hindered by such masses adhering to it, a very different condition

¹ *British Medical Journal*, 1872.

obtains; under such circumstances each further detachment of the retained portions opens fresh blood-vessels, and if those portions increase in size by fresh deposits of blood on them, the uterine cavity is again enlarged; its wall relaxes, and the vessels belonging to the latter grow fuller.

Moreover the uterus may be maintained in a state of great hyperemia by purely mechanical influences, e.g. by anomalies in its position, especially retroflexion; by an erect position of the woman, by premature physical exertion, or by the condition of the neighbouring organs (accumulation of faeces). The same result again may suddenly be produced by an increased vis a tergo on the side of the heart (as in cases of hæmorrhage after emotional disturbance, stimulating food). Under all these influences the vessels become so full that, in spite of the thrombi, they pour out their blood on to the wounded surface of the uterus; indeed it is owing to much the same causes that menstruation is so often too copious and too frequent. But the majority of these conditions are at the same time obstacles to a sufficient retraction of the uterus, and ætiologically this always plays the principal share in provoking such attacks of hæmorrhage.

§ 802. I have already stated that secondary hæmorrhage is rarely copious enough to cause immediate anxiety, and this is especially true of hæmorrhage resulting from simple atony or hyperemia. Only once have I met with a case of purely atonic bleeding on the 4th day, which rapidly became dangerous to the woman on account of its profuseness. As a rule there is merely a prolonged and very bloody lochial discharge. *Copious bleeding, i.e. true flooding, is almost always due to retained masses; these may either consist of bits of placenta, of membranes, or simply of a clot.*

Bits of placenta are most often retained, where the after-birth has been artificially removed, but sometimes also after its spontaneous expulsion; either because one lobe was more firmly adherent to the uterine wall than the neighbouring ones, and consequently separated from them, or because the retained portion was a placenta succenturiata (*cf. supra*, § 97). If the lobe is large, it usually decomposes, and then the hæmorrhage is relatively slight; indeed it may be quite absent, as I have more than once observed. In rare cases, and probably when it is already very condensed and non-vascular, the lobe may remain in

utero for a considerable time practically unaltered; it then forms a placental polypus, and causes hæmorrhage (much in the same way that a polypoid myoma does), until it is removed, or spontaneously expelled after disintegration of its base of attachment. If the remnants are smaller and especially flatter, they may form the nucleus of a fibrinous polypus in the way described in § 409.

Remnants of foetal membranes or decidua (the causes of their retention, have been already mentioned in § 702) almost always delay involution. But more copious hæmorrhage only arises, when such remnants (like bits of placenta at other times) form the starting-point for the formation of a fibrinous polypus.

I once saw a polypus, which originated in this way and at first merely caused a trace of blood, discharged on the eleventh day of the post-partum state, and the most intense "pains", and accompanied by considerable dilatation of the cervix, and by such copious hæmorrhage that acute anæmia rapidly resulted. The uterine cavity became so greatly dilated, that I was able without much difficulty to introduce fully half my hand. Secondary hæmorrhage, produced by atony, occurred more than once, and only with great care was the woman saved.

A *simple coagulum* is sometimes left *in utero* after expulsion of the placenta; it then probably at first was free, and only subsequently adhered to the inner surface and especially to the placental site, and thus became sessile. At other times the blood, on escaping from that site, has become intermingled with its projecting thrombi, until it appears as a simple continuation. This seems to happen most often, where the placental site is very relaxed, and where contraction and relaxation of the organ rapidly alternate. Such simple coagula may develop into fibrinous polypi, much in the same way as those which have been deposited round remnants of the ovum. Nor indeed does it signify, in regard to the mechanical sequelæ, how the connection with the uterine wall has been brought about.

Large placental lobes, when retained, cause less danger by hæmorrhage than by their *putrefaction*; for it is through septic infection of the placental thrombi passing into such lobes, that the phlebitic form of septicæmia (§ 857) is so very apt to develop, while the putrefaction of the small remnants, of bits of membrane, and of clots only as a rule provokes a moderate absorption fever. With *fibrinous polypi* on the other hand, hæmorrhage is the main symptom, and will be all the more copious, the larger the hæmatoma grows, and the more the uterus is thereby excited

to contractions. This is due to the fact that with the latter the organ becomes more vascular, while fresh vessels are opened at the point of attachment, owing to the traction exerted by the retained body, as it is driven into the cervix. The most profuse floodings therefore do not as a rule occur very soon after delivery, but only after a few days. I have several times seen them delayed until the end of the first week.

§ 803. The actual cause of the hæmorrhage can only be *diagnosed*, by making a careful exploration, although the history of the patient often enables some conclusions to be drawn. The hypothesis of an atonic condition must only be accepted, when the uterine cavity is proved to be empty, and when no other abnormalities are present. The existence of retained masses (supposing such not to be already felt in the cervix, or at any rate over the internal os) must be regarded as probable, when the body of the uterus continues bulky, when hæmorrhage recurs from time to time, and there is a persistent discharge of a thin, sanguineous, usually somewhat offensive serum during the intervals, which discharge becomes purely sanguineous and more copious, as soon as the uterine cavity is explored with the sound, and opened up. Dilatation of the cervix, when necessary, will clear up condition (*cf.* § 413).

§ 804. *Treatment* must depend on the information obtained in the way described above, as regards the immediate and primary causes. The practitioner will then at once be able to decide which general remedies are to be used; when the uterus must be restored to its natural position, and be retained there by pessaries or even tents; when ergot, cold or hot irrigations will suffice; when retained masses must be extracted, and when styptic uterine injections are called for. In the chapter dealing with "Atony of the Uterus" occurring *post-partum* (§ 682), and in that on "Abortion", all the necessary details will be found. The rules given under the last heading (§ 418—420), as regards the removal of remnants, are particularly useful for the same proceeding after a full term delivery, but it must not be forgotten that, however necessary it may be to cleanse the cavity of the uterus from the retained masses, it is equally desirable to use the greatest gentleness and caution, so as not unduly to damage and irritate the inner surface. Unless such precautions are used, sloughing endometritis may follow as late as 2 or 3

weeks afterwards. The subsequent treatment must be even more carefully attended to here than after abortion, every impediment to involution being, as far as possible, avoided.

§ 805. *Uterine hæmorrhage, which does not arise from the placental area and its vicinity, and which is not caused by new formations, is extremely rare in the puerperal state. Its source is then almost invariably in the cervix; either a varicose vein, as Hecker¹ and Amann² observed; or an ulcer (Mikschick³), or a ruptured hæmatoma of this area⁴. The cases of Hecker and Mikschick ended fatally; the former on the 33rd day of the lying-in period, repeated hæmorrhages having occurred after the 8th. Graily Hewitt⁵ relates an instance of hæmorrhage from an arterial aneurysm lying free on the inner surface of the uterus; it began on the 13th day, but only caused death on the 37th. Johnston⁶ has published a similar case, in which the first attack of hæmorrhage caused death on the 4th day. Its source was traced to the ruptured sac of the thrombus in the uterine wall, lying at the point where the body was continuous with the cervix; in the *Dublin Quarterly Journal of Medical Science* for May 1851 however, this area is described as a varicose aneurysm in the uterine tissues. Hæmorrhage, due to these causes, may be more common than the number of published observations would indicate. Many may elude accurate diagnosis, from the fact that they cease spontaneously, or with the use of local styptics, and do not end fatally.*

d. Venous Thrombosis of the Lower Limbs (Phlegmasia Alba Dolens).

§ 806. In giving this disease a place amongst the disorders of involution, I am dealing solely with those cases of thrombosis, which are intimately connected with the puerperal state, and which at the same time have no ætiological relation with septic contagion. I admit that they are frequently complicated by other puerperal diseases, and that their association with the latter

¹ Cf. *Monatsschrift f. Geburtskunde*, vii., p. 2.

² *Klinik der Wochenbettkrankheiten*, p. 213.

³ *Zeitschrift d. Gesellschaft d. Wiener Aerzte*, x., 1854, p. 178.

⁴ Murray, *Obstetrical Journal of Great Britain*, i., 1873, p. 11.

⁵ *London Obstetrical Transactions*, ix., p. 246.

⁶ Sinclair and Johnston, *Practical Midwifery*, 1858, p. 501.

(which sometimes appear as cause, sometimes as effect of the puerperal toxæmia) is a very close one, and that thrombosis, phlebitis and septic infection cannot always be strictly distinguished ætiologically. Still, on the other hand, puerperal thrombosis has been far too much mixed up with those complications, and it is very desirable that we should study *simple uncomplicated thrombosis*.

The lying-in state is exceedingly favourable to the coagulation of blood in the veins of the pelvis and thighs. It is always a traumatic condition, while in the uterus there are always venous thrombi, and the continuation of the latter in a central direction, along the venous trunks and their peripheral ramifications, is always a possible sequel. Thrombosis in individual pelvic veins may be far commoner than is generally supposed, for the reason that, when limited in area, it causes no symptoms. To this liability, which accompanies the injuries incidental to labour, other causes, lying in the vascular system itself, are frequently superadded, causes which, it is true, often seem to show that the coagulation is independent of the placental site, but which are therefore all the more important. Thus on the one hand the puerperal state of the blood is favourable to coagulation, such coagulation being, as we know, prone to occur, wherever the blood is impoverished, as it not infrequently is during the puerperium. On the other hand the pelvic and femoral veins are often enormously dilated, while the anatomical relations at the origin of the femoral vessels still further promote the already existing retardation of the blood-flow. As an additional factor we have in many cases the prolonged inactivity of the muscles of the thigh, and a diminution in the force of the heart's action in individuals who have been weakened by the preceding processes. But although the post-partum condition of the blood is doubtless very important, yet we must consider simple thrombosis as mainly a result of the dilatation of the veins, and of a state of marasmus. I cannot attribute this disorder to the pressure of the uterus or of the foetal head on the pelvic vessels, as is usually done; the disease is too rare for this view to be true, while moreover it as a rule only begins 1—2 weeks after labour, during which time the venous circulation continued in regular progress.

Pelvic thrombosis, as already mentioned, frequently eludes observation; but *thrombosis of the thighs* cannot do so. The latter

is therefore almost the only form of simple thrombosis which comes under our notice.

§ 897. *Phlegmasia alba dolens*, as this disease used to be termed¹, has always attracted great interest on the part of obstetricians. But its anatomical situation and the co-existing obliteration of veins were first of all correctly recognised by Davis (*Cyclopaedia*, iii., 1817) and by Bonillaud (1823), further light being thrown on the subject by Robert Lee in 1829, and afterwards by Bouchut in 1844.

The disorder sometimes shows itself during pregnancy, and may then become aggravated soon after delivery. But as a rule it only sets in, as already stated, after the completion of the first week, on an average between the 10th and 21st days after labour: the further the onset is removed from these limits, the more rarely is it observed. Varices predispose. The left thigh is more frequently affected than the right, possibly because it is more often varicose. This greater liability may be a result of the relation of the left iliac vein to the right common iliac artery, of the pressure to which the former is exposed from the iliac artery, which crosses over it to the right side, and further downwards from the hypogastric artery; at necropsies an impression, caused by the artery, has not infrequently been observed on the venous thrombus at the point of crossing. Occasionally too both thighs are affected, although rarely independently of each other; the thrombosis has usually spread from one vein to the other through the vena cava, or else thrombosis occurred in the second thigh, because the latter was unable to empty its blood into the thrombosed vena cava. At all events bilateral disease is scarcely ever simultaneous on the two sides, some interval being detectable. The usual seat of the disorder is the femoral vein and its ramifications, especially the tibials, the peroneals and the saphena; but the profunda may also be involved.

The onset is often preceded by a general feeling of *malaise*

¹ Many writers (e.g. Winkler) include under this term phlegmon of the thighs, and describe the latter as a second variety of *phlegmasia alba dolens*. Owing to the indefiniteness of the name, this may no doubt be done with a certain amount of reason. But since phlegmon is always a secondary condition, which accompanies the puerperal venous diseases, while thrombosis is frequently an independent affection, it is better to restrict the name to simple thrombosis, i.e. if it is worth while to retain it.

and feverishness; sometimes a rigor introduces the illness. The latter however often begins without any signs of irritation, and a serious rise of temperature must be regarded not as an ordinary symptom, but as due to some complication. The first characteristic symptom is usually a dull, tense, dragging pain, either in the whole limb or in some particular region; in the latter case the pain is most often located in the calf, in the popliteal region, or in that just below the groin. In rare cases it resembles severe neuralgia, being increased by movement of the limb, frequently so much so that movement becomes impossible. Generally speaking, only the region which corresponds with the course of the affected vein, is sensitive to pressure, this being usually the calf, or the antero-internal portion of the thigh.

The onset of the pain is soon followed by swelling of the limb, this either being general, or progressive from below upwards, or from above downwards. The last variety is the most common; for I, like others, cannot accept the statement, made by Trousseau, that the swelling invariably advances upwards, *i.e.* from the leg towards the pelvis. In a few instances I have seen the swelling confined to the thigh, and others have observed the same. The increase in size is usually considerable, and occasionally varies in different regions. At first the swelling is rather hard and tense, but subsequently it becomes œdematous and doughy, owing to a portion of the rapidly transuded fluid having been absorbed by the lymphatics. The affected region is pale and shining (called "marble leg" in England), conditions to which it owes its name, although that name may be false from first to last. Here and there a large red spot is noticed, corresponding to some net-works of minute cutaneous veins; indeed the latter generally appear to be better developed than usual. Where the œdema has developed slowly, the temperature of the limb is not raised; a rise only accompanies a rapidly developing and marked œdema; and in uncomplicated cases soon disappears. The thrombosed veins feel like hard cords, often furnished with knotty swellings (thrombosed varices), when they lie superficially, or when, if deeper placed, the œdema has diminished and grown softer. These cords moreover are usually sensitive to pressure, and the skin is red along their course, all of which phenomena are most distinct, where groups of subcutaneous veins are attacked. The woman keeps the

swollen leg semi-flexed and motionless, partly on account of the pain, partly because the muscles are weakened through the œdema; movement of even the toes is sometimes rendered difficult, or actually impossible. Passive movement causes no pain. The general symptoms are slight in a case of simple thrombosis, and together with the dyspepsia and the constipation, are merely caused by the enforced repose, by the pain and by the at first slight irritation in the thigh. If they grow severer, phlebitis has developed, or some other serious complication co-exists.

Progress.

§ 808. The disease is one that develops rapidly, but whose further progress is slow. The usual termination is for the *thrombus to be absorbed, and for the vessel again to become patulous*. The swelling rarely remains tense for more than 5—8 days, but the doughy œdema scarcely disappears under some weeks; indeed in a slight form it may last much longer still. The sensitiveness to pain continues *pari passu* with the hardness; and if nothing remains except a doughy condition, the pain may be entirely absent, and the woman in other respects feel well. The hard, venous cords gradually grow softer and less tender, until they can scarcely be felt on palpation. The mobility of the thigh increases in the degree in which the tension and pain subside.

In somewhat rarer cases the affected veins or some of them remain permanently blocked, and the *thrombus, together with the wall of the blood-vessel, is converted into a solid, tough band of connective tissue*. The limb then remains for a long time thick, and unable for much movement; the swelling increases again and again, especially with the erect posture, and thus incapacitates the patient for regular exercise during a long time, possibly for months; indeed the condition of weakness and the tendency to swelling may persist for years. Occasionally the swelling has been seen to pass into hypertrophy of the skin and of the subcutaneous cellular tissue, i.e. into elephantiasis; but under such circumstances the lymphatics must either primarily or secondarily have been diseased. Dance met with an instance of ascites, but this is one of the rarest occurrences; so also are the occasionally co-existing bowel disorders (Baart de la Faille),

which probably are a result of the thrombosis of a portion of the portal vein.

Periphlebitis with suppuration is still rarer. I have only seen it with thrombosed varices, and then once or twice simultaneously at several points. I suspect that where it occurs without such thrombosis, septic infection must have played a share. The suppuration is usually confined to the immediate proximity of the vein. The constitutional disturbance is then inconsiderable, and the prognosis is almost always good; the abscess, if emptied, soon closes. But it must not be forgotten that the inflamed wall of the vessel may also cause the thrombus to suppurate, and that, if the suppurating portion is not firmly and safely shut off from the free lumen of the vein, there will be great risk of septicæmia and pyæmic embolism. Diffuse and progressive phlegmon, starting from the inflamed vessels, and followed by extensive undermining of the skin, probably always arises from septic infection, or with simple thrombosis only occurs in very much weakened persons. Under the latter condition I have seen it once; well marked thrombosis was caused by marasmus after distinct pneumonia. There is great danger of phlegmon in such cases; as a rule death takes place through exhaustion, if not even earlier through suppuration and disintegration of the thrombi lying in the phlegmonous tissues.

Another serious termination, even with quite simple thrombosis, and to which we referred in the previous chapter (§ 780), is the detachment of the end of the thrombus which projects into the free lumen of the vein, followed by embolism of the pulmonary artery. Happily the embolus is rarely large enough to cause alarming symptoms or sudden death. The fact that this occurrence generally results from unnecessary manipulations of the diseased vessels, or from violent or severe movements of the body (in consequence of which the more rapidly circulating blood tears away the thrombus), shows how the accident may be avoided.

Treatment.

§ 809. The earlier view, that phlegmasia alba dolens depended on phlebitis, led to its being treated with active antiphlogistic remedies, with local and even general bleeding, with the local and general use of mercury &c. But the above remarks on the

nature of simple thrombosis, the truth of which is confirmed by experience, will show that all such remedies are best left on one side; particularly as this affection frequently attacks enfeebled individuals, and is so often connected with marasmus. It would be more rational to adopt a tonic treatment, for example a course of quinine and iron, based on the view that the disorder always arises from toxæmia. But even this is unnecessary, at any rate at first. Inasmuch as the disease usually and spontaneously tends to a favourable issue, nothing need be done, except to bring the body and especially the attacked limb, under the most favourable circumstances, and apart from this merely to treat the symptoms. The chief point in regard to the first indication is absolute rest for the thigh, and consequently for the patient. In order to use the force of gravity in counter-acting stagnation of blood, the leg should be placed on a somewhat higher level than the trunk; this is best done by raising the mattress, since any pillows or cushions that are pushed under the leg, for the purpose of supporting it, necessarily interfere with the circulation by local pressure, and also cause pain. The tension, which characterises the early stage, may be alleviated by a slightly flexed attitude of the leg, by gentle and cautious inunctions of fat, and by wrapping it in soft wool. If the limb is very tense and painful, hydropathic bandages, warm flannel fomentations (these being enclosed on all sides by some impermeable material) will give relief. Sometimes moreover a liniment of opium or belladonna is of use; so too are occasional inunctions of mercury, especially where the transuded fluid is not, or is only slowly, being carried away by the lymphatics. On the other hand, as long as the condition is acute, I must strongly warn against any irritating applications, especially against the application of *tr. iodi*, which has sometimes been recommended.

As soon as the swelling becomes doughy, all local remedies may be given up. It will then be sufficient to bandage the limb evenly, but not too firmly, from the foot to the groin, with soft flannel, the bandages being changed morning and evening. At each removal the thigh may be rubbed with some alcoholic lotion. These measures encourage absorption and tend to diminish the swelling. Any friction however must be carried out with great gentleness and care, lest the thrombosed vessels grow inflamed, or the thrombi be broken down or loosened, as a result

of rough treatment. I have more than once mentioned the danger which is apt to arise, and it is well illustrated by a case related by Trousseau¹.

These simple measures should be persevered with, until the woman is completely restored. She may, if her leg is bandaged, occasionally leave her bed, and take to the sofa; but only very gradually should she begin to walk. To insure that the medical directions are adhered to, the woman should be informed as to the nature of her condition. No special internal remedy is necessary, the general health being however kept under supervision. It is very important to attend to regular action of the bowels; warm baths are permissible, and often very useful for completely restoring the affected limb. If the latter remains permanently swollen, it is a good plan to rub in an iodine ointment, and especially cod liver oil combined with iodine; if the limb shows a persistent tendency to swell after movement, an elastic stocking, reaching up to the highest part of the thigh, should be worn for a long time.

Periphlebitis, or marked irritation of the wall of a blood-vessel, may sometimes be successfully combated at the very start by the timely application of a few leeches, and by a mercurial liniment. If this fails, the affected region should be poulticed and opened in good time. More serious complications must be treated according to their general and special indications.

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¹ Cf. "Clinique de l'Hôtel Dieu," *Gazette des Hôpitaux*, 1860, p. 677.

2. Affections of the Bladder and Urethra.

We have already described the injuries to the bladder and urethra, that occur during labour (§§ 719 *et seq.*). Here therefore we have simply to deal with inflammation, and with the functional disorders known as spasm of the bladder, retention and incontinence of urine.

§ 810.

a. Cystitis

is either an independent catarrh, or else a disorder which has extended from the neighbouring organs to the vesical mucous membrane. In the latter case the inflammation of the pelvic serosa or connective tissue (cystitis serosa and paracystitis) spreads to the mucous membrane of the bladder, or, as is more common, endometritis and especially endocolpitis involve the vesical walls, that are in close contact with the regions primarily attacked. These inflammatory conditions are therefore simply sequelae of puerperal traumatic diseases, and, although often very troublesome, must be regarded as merely symptoms of more important affections.

Vesical catarrh is frequently produced by the bruising and traction, to which the bladder and especially the urethra are exposed during labour. Indeed we know how often more or less deep lacerations of the mucous membrane extend round the urethra, and about its lower wall; and from these parts inflammation is apt to spread gradually to the inner surface of the urethra, and to the lowest portion of the bladder. Cold is not sufficient to produce this catarrh, although it aggravates an already existing disorder. The principal cause is beyond question *the use of the catheter*. This instrument does the mischief, both by the mechanical irritation it provokes, and by introducing germs. The urinary passages are at all times highly sensitive to foreign bodies, and especially are they so during the puerperal state, when they are hyperæmic, swollen, and, as already pointed out, often very lacerable. The germs, which are introduced by the catheter, may either be contained in the air, which is inside, and enters with, the instrument (as Traube first pointed out), or else they are directly adherent to the latter, either from want of proper cleansing, or because (as Olshausen and Kaltenbach

showed) the catheter conveyed lochial or wound secretions with it, at the time of introduction. The more putrid those secretions, the greater the resulting vesical disorder, and *vice versa*. The contused and hyperæmic condition of the urethral and vesical mucous membrane, and its doubtless not infrequent partial deprivation of epithelium promote the injurious action of the transplanted germs. The experiments of Dubelt¹ show that decomposed urine provokes but a moderate degree of inflammation, when the bladder is healthy; the inflammation being severe only where the mucous membrane has been injured.

§ 811. The *symptoms* and disorders, associated with catarrh of the bladder, are frequently so slight (*e.g.* slight dysuria or scalding during micturition), and so soon pass over, that they are lost amid the other phenomena of the post-partum period, and the affection remains unnoticed; such cases are therefore doubtless much commoner than would appear from the number of published observations. In the *severer* attacks, the principal symptoms are pain during micturition, dysuria and occasional retention of urine. Pain is never absent; it lasts for some time after the evacuation of the bladder, and then frequently radiates as far as the region of the kidneys. The dysuria is caused by the great irritability of the bladder, especially of its lower portion, which is often injured. The retention of urine is mainly due to an obstructing plug of muco-pus, rarely to spasm of the sphincter, or to weakness of the detrusor; the last condition only supervenes at a later date. The urine itself is loaded with pus and mucus, and is not uncommonly slightly blood-stained; it contains albumin, even in the mildest attacks. The region of the bladder is sensitive to pressure. The lacerations of the vaginal orifice and vestibule, caused by labour, are readily converted into sores by the action of the urine, nor can this always be entirely prevented, even with the most scrupulous cleanliness. The woman's general health is never quite normal, there being always more or less feverishness. Only in the more serious cases however is this mainly due to the vesical disorder; as a rule the general condition is such as would correspond with the puerperal state, the vesical catarrh being superadded.

The *issue* is almost always favourable. Mild cases recover spontaneously during the lying-in period with proper care, and even

Cf. Archiv f. Klin. Med. u. Chir. p. 126.

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It is not to be removed from the

the severer ones, if properly treated, terminate in recovery. Sometimes however the puerperal vesical catarrh is the beginning of a chronic affection; indeed the majority of chronic cases in women start during some puerperal period. But there are then usually other sequelæ of the latter in the pelvis, especially peri- and paracystitis, *rel*—metritis, or ulceration of the neck of the bladder. Kaltenbach has pointed out that this vesical catarrh may be the starting point for general catarrh of the urinary passages, extending as far as the renal pelves.

§ 812. *Treatment* does not differ materially from that appropriate under other conditions. The best prophylactic measure lies in a careful attention to the causal lesions in the neighbourhood of the urethra, in enjoining cleanness and regular micturition. The catheter must only be resorted to in cases of retention, where absolutely necessary. When so required, a metallic, thoroughly disinfected, instrument must be used, and only after exposure of the urethra (never beneath the bed clothes), and after its orifice has been carefully cleansed from any adherent wound or lochial secretions, with the help of a linen rag dipped in carbolic lotion. Not infrequently, where micturition is difficult, warm fomentations and friction, applied to the neighbourhood of the bladder, will dispense with the necessity of catheterisation.

If the vesical catarrh is moderately severe, poultices, warm fomentations of turpentine on the hypogastrium, warm vaginal irrigations, tepid baths and opiates *per os* or *per rectum* are the best remedies in the acute stage. The bowels should be kept freely open, salines purgatives being preferable. The diet should be restricted (milk, thin soups), but soda or Seltzer water, or the water from Wildungen¹ or Bilin² may be used copiously. The catheter must only be resorted to in cases of actual retention, *i.e.* when no urine has been passed for 12 hours; earlier than that, only if decomposition of the urine renders an injurious result certain. With this treatment severe symptoms usually soon subside, and recovery follows.

Where however the catarrh is *chronic*, local treatment, *i.e.* irrigation of the bladder, is the chief point. It always gives great

¹ Cold, alkaline, ferruginous waters from Wildungen, Waldeck, Germany. (Tr.)

² An alkaline water containing much sodium carbonate with a little lithium and calcium carbonate and some sodium sulphate; exported from Bilin, in Bohemia.—New Syd. Society's Dictionary. (Tr.)

relief, and the symptoms rapidly disappear. With a view to disinfection and to allaying irritation, it is well to begin with tepid, weak carbolised water (1 : 300—500) at ca. 33—34° C. (91° to 93° F.); afterwards when the suppuration is free, warm astringent lotions are best, amongst which I can especially recommend the aqua picis liquidæ, weak lead lotion (diluted 20 times), nitrate of silver solution (1 : 250—500), or tannin (1 : 100). The irrigation must be carried out at least twice daily, Hegar's funnel being most useful for the purpose, since with this apparatus the fluid can be allowed to remain in the bladder for a few minutes or longer: or else an irrigator may be employed, into whose tubing a short glass T-tube with an efferent piece is inserted. By raising the irrigator and closing the escape pipe, the bladder is filled, while on depressing the apparatus and opening that pipe, the fluid is again drawn off. The amount of lotion, used in any particular case, must be regulated by the capacity of the bladder and the severity of the catarrh, but on average not more than 100—125 grms. (3½—4 oz.) should be admitted. The effluent fluid ought to be free from pus and mucus.

This is not the place for a full description of the general and after treatment. A carefully regulated diet and baths usually suffice for complete restoration.

b. Neuroses

of the urinary passages are very rarely primary affections, *i.e.* independent of injury; as a rule they are merely symptoms. Thus for instance

§ 813.

(1) *Spasm of the Bladder*

—the painful irritation of the nerves of the bladder, accompanied by frequent calls to pass water, by scalding and vesical tenesmus—is almost always due to wounds (fissures) of the neck of the bladder, rarely to inflammation of its walls, and still more rarely is it independent of every other disease. In the former conditions, the diagnosis rests on the fact that the urine contains pus and blood, while in the last-named, the composition of the urine is normal. In both varieties (*i.e.* the inflammatory and the purely nervous spasm) the urethra and bladder are highly sensitive to the catheter, and there

are in addition many neuralgic and sympathetic pains, quite apart from micturition. Sometimes, in spite of a desire to micturate, the evacuation of urine is painful and slow, the sphincteric muscles being spasmodically irritated, at the same time that the desire sets in. But the severest colicky pains invariably accompany the termination of micturition, and are then frequently associated with rectal tenesmus. Thus the disorder presents very similar symptoms to those of calculus. On one occasion I have seen it actually due to such a cause during the puerperium.

The diagnosis of the cause of vesical spasm must always be made with care, for the sake of selecting the best treatment, nor will the practitioner find any difficulty in arriving at a diagnosis by a process of exclusion and by the help of an accurate exploration. The inflammatory variety must be treated in the way indicated above; simple neuralgia with careful diet, quinine, potassium bromide, or chloral hydrate in large doses. But in both conditions the sudden dilatation of the urethra with Busch's dilator¹ or with Simon's urethral speculum is the best remedy, just as the forced expansion of the anus is for spasm of that region.

(2) Retention of Urine.

§ 814. Slight degrees of ischuria are common immediately after delivery, owing to the increased capacity of the bladder, and to the weakness of the abdominal muscles (*cf.* § 213). The severer forms too have as a rule only *mechanical causes*, amongst which the principal ones during the first days are *urethral obstruction, produced by a swollen condition, or by a plug of mucus, and above all flexure of the canal.* According to Mattei and Olshausen, such flexure arises from the descent of the uterus after delivery, the urethra having been drawn up and stretched during the preceding pregnancy. Sometimes again urine is retained, because its evacuation through the sore urethra causes too much pain, the sphincteric muscle overpowering the detrusor. In cases of uncomplicated retention during the later days of the lying-in state, it is always well to think of *retroflexion of the uterus*, especially in persons who have

¹ Sims' speculum is nothing more than an imitation of Busch's

previously suffered from such displacement; I have however known this form of retention of urine show itself once as early as the 4th, and once on the 6th day.

Paralysis and paresis of the detrusor are rare. The former has never come under my observation; but Scanzoni records its occurrence, during the last stage of severe puerperal fever. It then probably depends on disorder of the sensorium, associated with the grave constitutional disease, provided the cause does not lie in some infiltration of the vesical muscle due to the septic peritonitis. Similar infiltration may probably also lead to the minor forms of bladder weakness, sc. *pareses*; for these are not infrequently observed with inflammation of, or in the neighbourhood of, the bladder itself, especially with cystitis serosa. Indeed I have occasionally seen this weakness with sloughing cystitis, a fore-runner of the secondary perforation of the wall of the bladder.

The bladder is capable of enormous distention during the lying-in state, where the abdominal muscles offer but little resistance. At a certain point, which varies with the irritability of the vesical muscle and with the intra-vesical pressure, the resistance of the sphincter may sometimes be overcome by that pressure; a portion of the urine then escapes, without however the distention of the bladder being appreciably diminished (*ischuria paradoxa*).

The effects of prolonged retention of urine are well known. The attention, which must always be bestowed on regular micturition during the post-partum state, will make the *diagnosis* easy. Nevertheless the distention of the bladder is apt to be obscured by the frequently co-existing flatulent enlargement of the abdomen, nor must the practitioner allow himself to be deceived by the partial discharge of urine. *Treatment*, both prophylactic and curative, consists in a timely and, where necessary, repeated catheterisation, the ætiological and co-existing conditions being of course borne in mind. The greater the weakness of the bladder, the more often should the catheter be used; under some circumstances it is well to leave the instrument for some time in the bladder, the tone of the latter being increased through being kept empty. Amongst the measures that are most useful for paresis, I may especially mention ergot (either subcutaneously or in clysters), preparations of *nux vomica* (e.g. *strychnia mgrm.* 2—4 = gr. $\frac{1}{30}$ — $\frac{1}{15}$), and induction electricity.

§ 815. (3) *Incontinence of Urine*

is a very rare disorder. An involuntary discharge, in conditions of great debility, is of course not referred to here, any more than the constant dribbling that accompanies vesical fistula. The remaining causes are bruising of the urethra and of the lower segment of the bladder during parturition, and further the dragging that is exerted upon it, when the uterus and vagina are displaced from their natural position. The urine either trickles incessantly, or else is only discharged when the abdominal pressure is thrown into action, as in coughing, sneezing or bearing down. This paralytic incontinence must not be confused with the desire to pass water at short intervals, which accompanies great irritability of the bladder, or a small capacity of the same, where there are mechanical hindrances to its expansion (e.g. pressure exerted by the neighbouring organs); such errors are not uncommon in practice.

In treating incontinence, the use of the catheter is generally of primary importance, the ætiological condition being of course also attended to. At other times the treatment that is appropriate to weakness of the bladder, will be called for.

LITERATURE.

Olshausen. *Archiv f. Gynäkologie*, ii., p. 273; *Berliner Beiträge z. Geb.*, ii., 1873, Sitzungsbericht, p. 71. Kaltenbach. *Archiv f. Gyn.*, iii., p. 1. Engel (abstract of paper in Magyar). *Centralbl. f. Gynäkologie*, 1878, p. 603. Schwarz. "Die Ätiologie des puerperalen Blasenkatarrh." *Dissertation*. Halle, 1879. Chamberlain. *American Journal of Obstet.*, x., p. 177.

3. *Neuralgia and Paresis of the Lower Limbs.*

§ 816. Amongst the functional disorders of the lower limbs, we shall only in this place consider those which are in ætiological relation to the changes accompanying and following delivery. In other words we shall only discuss those of peripheral, not those of central origin.

These lesions are far from rare. A certain number of cases, in which locomotion is painful or impossible, arise, as already mentioned (§§ 748 et seq.), from *diastasis and rupture of the pelvic articulations*; in such both thighs are usually affected.

We have also discussed (§ 807) the symptoms that accompany *venous thrombosis*, and which belong to this place; these are usually unilateral.

In the remainder of the cases belonging to this category, there has been some *mechanical injury to the nerve itself*, viz. to that part of it which runs through the pelvis. The injury may be caused by inflammatory processes which have involved the nerve, or by the pressure of pelvic exudations, or merely by the pressure of labour. Since these causes as a rule only affect one side, the resulting disorders too are generally unilateral.

We have only a few cases on record, which can without any hesitation be attributed to the first cause, *i.e.* to *neuritis*. This appears especially to follow phlebitis or periphlebitis, where the infiltration extends to the nerves lying so near to the vessel. Leyden has published a good instance of this, which occurred in La Charité¹.

Attacks of neuralgia and paresis, originating from *parametric exudations and indurations* are well known; they are by no means uncommon, apart from the puerperal state. The varying seat and extent of these morbid products explain why the disorders in question affect the most diverse tracts, and act in the most various combinations, sometimes mainly involving the course of the anterior crural, sometimes that of the obturator, sometimes that of the sciatic nerve; the two last are the most commonly affected. In these cases the neuralgic symptoms predominate over the paralytic. The latter are mainly consequent upon the pain which movement causes, and usually only become prominent during the later period of childbed, when the infiltration has become dense, and consequently drags and presses upon the nerves.

§ 817. The *pressure associated with parturition*, most frequently acts on the lateral branch of the sciatic, *i.e.* on the peroneal, nerve. Its fibres are derived from the combined lumbar and the first and second sacral nerves (lumbo-sacral cord), and this is almost the only nerve, which can be pressed upon at the brim of the pelvis, where of course the pressure during labour is most severe. Such pressure acts at the point, where the nerve turns downwards and backwards from the posterior edge of the brim, in order to form the sacral plexus. Consequently this *traumatic*

¹Cf. *Charité-Annalen*, 1862, vol. x.

neuralgia and paresis are mainly observed, where, owing to pelvic contraction and especially to the head engaging in an unfavourable manner (face and brow presentations, extra-median entrance), prolonged unilateral pressure has been exerted at that spot. The use of instruments, which is so often resorted to in such deliveries, especially that of the forceps, has been accused of causing such pressure, but unjustly so in the majority of instances, for the simple reason that such instruments operate within the pelvic cavity, while moreover their pressure mainly acts on the side walls of that cavity, and not on the posterior, where the nerve trunks lie. And although it cannot be denied that instruments are quite capable of causing severe contusion of the nerve trunks, yet such injury has usually occurred before their application, or else the nerve is only involved through the subsequent pelvic inflammation.

The traumatic affection is almost invariably (more often than any other variety) *unilateral*. The pain frequently begins during delivery, or at any rate immediately afterwards, and is moreover severest at that time. It is mainly seated in the calf, the outer side of the leg and foot, but also in the heel and great toe. Simultaneously with this there is some paralysis of the whole lower half of the body, dependent on the pressure to which the walls of the pelvis have everywhere been exposed, and which is therefore only temporary. As must necessarily occur where a mixed nerve is affected, the most various symptoms gradually set in, showing that both sensory and motor fibres have been injured; but by degrees the paralytic phenomena grow most marked. Occasionally trophic disorders also follow.

§ 818. In whatever way the affections mentioned above may have arisen, complete restoration of the normal functions usually occurs, although not uncommonly there is considerable delay. The prognosis is worst with traumatic paralysis; here complete loss of power may persist, if the sacro-lumbar nerve has been so seriously bruised, that no recovery can take place.

The only way of *preventing* this lesion is, as far as practicable, to obviate any excessively prolonged, and unequally distributed pressure during delivery. The fact however that it is impossible to tell beforehand what can be safely borne, and that other injurious influences than the existing ones have so often preceded, shows that it will frequently be impossible, even with

the greatest care, to prevent the development of neuroses of the thighs.

Treatment must depend on the nature of the mischief, and I need not describe the appropriate measures, which are well known. Equally familiar is the symptomatic treatment of neuralgia and paralysis; for the first, morphia may be given subcutaneously; for the latter, local cutaneous stimulation, diaphoretics (Boer's method of applying a ring of emplastrum lytta below the knee is good), and induction electricity can be recommended.

LITERATURE.

Imbert-Gourbeyre, *Mém. Acad. de Médecine*, Paris, 1861; Fensell, *St. George's Hospital Reports*, i., 1866, p. 197; Bianchi, *Gazette des Hôpitaux*, 1867, No. 53; Lefebvre, *Des paralysies traumat. des membres inférieurs conséq. à l'accouchement laborieux*, Paris, 1876.

4. Disorders of Lactation.

The principal minor disorders of lactation were referred to under "Management of the Puerperal State" (*cf.* §§ 235, 236). Here therefore I have merely to discuss exhausting galactorrhœa¹, sore nipples, inflammation of the mamma and galactocele.

a. Galactorrhœa.

§ 819. This name must only be applied to cases in which the flow of milk is so copious as to exhaust the woman. A mere excess of lacteal secretion, *i.e.* the formation of more milk than the babe requires, is not a morbid condition, so long as the strength of the nursing mother remains unaffected, so long as the abundant production is a result of a healthy state of nutrition, and the stimulation and irritation of the gland are normal. In such cases milk usually continues to flow after the child is satisfied; some also escapes from the unused breast, while the other is being sucked. If such a condition causes trouble, the supply of nourishment may be curtailed, and, if

¹ A deficient secretion of milk, *agalactia*, is not amenable to treatment, since it either depends upon defective development of the substance of the gland, or on deep disturbance of nutrition, and the latter, if ever open to treatment, is certainly not so during childbed.

necessary, the surplus secretion may from time to time be artificially withdrawn from the gland (§ 236).

True galactorrhœa is characterised by an almost incessant trickling of milk, and by the latter being thin and deficient in solid constituents. It is not only met with in nursing women, but sometimes too for a considerable period after weaning, occasionally even in persons who have never suckled, and during pregnancy—proof that an unduly prolonged lactation is not the cause, as many assume. We do not as yet know the actual nature of the disorder; the mischief probably lies in the secretory apparatus, *i.e.* in some abnormal vaso-motor condition of the glandular vessels, in an alteration of pressure¹ in the latter, in some morbid condition of the vascular wall, or in a deficiency of muscular elements, or of tone in the organ². The onset of menstruation has no effect on the quantity of the secretion, at any rate not on severe galactorrhœa; indeed attacks of menorrhagia are by no means rare during the latter. Such women can scarcely become pregnant.³

Galactorrhœa soon induces a state of great debility. Assimilation never keeps pace with colliquative discharges; indeed as a rule it also is greatly disordered, and when the excessive secretion is at all prolonged, actual wasting of the tissues may result (*tubes lactea*). The disease may cause death by giving rise to acute tuberculosis. Anomalies of vision are comparatively often met with, although they usually disappear, when the general state improves.

A woman, suffering from true galactorrhœa, must not suckle; indeed the child will rarely thrive on the thin nourishment, while on the other hand suckling still further increases the secretion. As soon as the nursing has been stopped, the bowels should be freely opened, and the breasts compressed, so as to diminish the afflux of blood to the latter; above all things the system should be strengthened by iron, quinine baths, appropriate diet and a change of air. If however the secretion resists all efforts to check it, a prolonged course of iodine, both externally and internally, appears from published observations to be of value. Joulin praises the agaricus laricis⁴, which was at one

¹ Cf. Rohrig, Virchow's Archiv, vol. 67: Winkler, Archiv f. Gynäkologie, 11, part 2.

² Cf. Prochownik, Centralblatt f. Gynäkologie, 1878, p. 3.

³ Agaricus laricis & albus (polyporus officinalis) is a fungus, which grows upon larch trees in the south of Europe; it is a violent drastic purgative. (Tr.)

time largely given for profuse perspirations, especially for those of phthisis; it may be given in doses of 1—1·5 gm. (15—22 grs.) 3 or 4 times daily, best as a powder and in capsules. Prochownick (l. c.) has seen good done by repeated weak Faradaic currents.

b. Sore Nipples.

§ 820. This name includes several conditions: *erosion, ulceration, fissure and eczema of the nipple*. They are all, with the exception of eczema, produced mechanically, viz. by the sucking of the child; the epithelium is first of all softened, and the mechanical injury follows. Hence they are especially found in primiparæ, the cuticle of whose nipples is on an average far more delicate than in multiparæ; they are next common with small and retracted nipples and with a scanty formation of milk, i. e. where the child has to tug repeatedly and forcibly in order to suck. Of course breast pumps, when badly managed, may have a similar effect. These conditions are all the more likely to arise, if the nipple has not been kept clean during pregnancy, for the reason that thick crusts of epithelium then collect on the wrinkled surface of the nipple, while beneath them the skin remains thin, and so easily lacerable, that the first attempts at suckling will remove the delicate covering. In two cases where the epidermis was very thin, I have seen the nipple of non-suckling women excoriated, simply through being macerated in the adherent secretion; but then of course the trouble is a trivial one. As would be expected from the above description, soreness of the nipples is most common soon after delivery, only rarely does it begin after the end of the second week of childbed. Sometimes a woman suffers from this affection after every confinement.

§ 821. *Erosion or excoriation* arises from a superficial loss of epithelium, through which the body of the nipple is laid bare. It sometimes starts with the formation of a few vesicles at, or below, the apex of the nipple, these forming crusts, beneath which, after softening and detachment of the crusts, the so-called *rhagades* are found. The sore spot varies in extent, and not infrequently there are several small ones isolated from one another. If the cuticle that forms, is again and again destroyed, or if the irritation continues, *ulceration* may result; the nipple then

looks swollen and granular, and often as if there were deep tears in it. Indeed a considerable portion of the nipple may be destroyed.

The pain, which accompanies these conditions, is always great, and with ulceration is excruciating. As soon as the child takes the breast, the pain begins, increasing with every additional suckling movement. Generally however it subsides to some extent, if the suckling is continued regularly. The nipple moreover is apt to bleed, and the child swallows blood with the milk, afterwards regurgitating the mixture. It is necessary to witness the suffering of such a nursing woman, in order to understand what sacrifice many mothers make for their child. After a time the nervous system grows so exhausted that this condition in itself necessitates the discontinuance of the suckling.

A *fissure* is a linear ulcer in the interpapillary furrows of the apex or base of the nipple. It is frequently so extraordinarily small as to be difficult of detection, especially when it accompanies a wide erosion. Such a fissure also may bleed during suckling, and cause quite as much pain as the flat ulcer.

It is a most praiseworthy act to try to avert these various conditions, or on occasion to get rid of them, without permanently arresting the nursing. As regards prevention, much can be done even during pregnancy, by cleanliness, by the systematic softening and removal of any crusts that form; by then using cold lotions, and (where the skin is very delicate) applying an ointment or solution of tannin; or some alcoholic lotion; it is also important at the beginning of lactation to show the woman how she should suckle her child (§ 295). But it would be too much to say that the above measures will always be successful.

A great number of remedies, all of them astringents, are recommended for sore nipples. Of course the sores heal most certainly, if the suckling is given up. But this is not necessary, at any rate at first; erosions and fissures may quite well heal, if they are simply touched with a stick of nitrate of silver, or still better if they are kept covered with a 5 p. c. carbolic lotion; and if, by letting the child suck through a nipple shield (india-rubber tent), the scab that forms, can be preserved, until it falls off of its own accord. As regards further measures I have stated what is necessary in § 296, and shall merely add

here that where there is well marked ulceration, nothing but an arrest of the suckling will lead to recovery; the earlier that this is decided upon, the more reason is there to anticipate such a speedy recovery that the nursing need not be permanently given up. Recovery may occur in a few days, and no harm results from such an interruption, if the secretion is in full swing.

§ 822. *Eczema*, starting in the nipple and spreading from it over the areola and the surrounding region, is rare, but always very obstinate. The thick crusts that continually form, must be as regularly softened and removed, the whole surface being thoroughly cleansed, and then smeared with oil of cade or a mercurial ointment (corrosive sublimate or precipitate). If the child continues to suckle, the nipple must, every time it has been used, be carefully cleansed with tepid water. The ointment is then applied, and the areola covered with a leaden shield, or with goldbeater's skin. The application can be rapidly and completely removed with the help of cold cream and warm water, before the child again takes the breast, or the child may suck through an india-rubber teat.

c. Inflammation of the Breast, Mastitis.

§ 823. The development of mastitis is so closely connected with lactation, that it is easy to see why the great majority of cases occur in suckling women¹; two thirds of the whole number are met with during the first two months after delivery. The causes moreover, which lead to inflammation of the mamma must usually originate outside the gland, and act upon it through the nipple and the openings of the milk ducts. Hence, bearing in mind how common during the early portion of lactation sore nipples are, we shall not go far wrong in regarding the latter condition as the principal source of mastitis. In comparison with this cause, whose importance has long been recognised by practitioners, all other etiological factors fall into the background; the only additional ones being traumatic in nature (injuries, blows on the breast), or in rare cases a general septic infection. There is no proof whatever, indeed it is exceedingly

¹ Amongst 72 cases published by Nunn, 58 occurred in nursing, 7 in pregnant, and 7 in non-puerperal women: in 102 recorded by Bryant, the numbers were 79, 2, and 21.

improbable (and there is no analogous event in the pathology of other glands), that obstruction to the exit of the normal secretion (*i.e.* retention of milk in one or several lobes of the gland) will lead to inflammation; the same is true of chills. The probable reason why these factors are still so frequently regarded as causal, is the fact that the original injury of the nipple was so trivial as to be overlooked.

The inflammation may either affect the skin and the subcutaneous layer, or the connective tissue layer between the gland and the pectoralis muscle, or the gland itself. Hence we may (with Velpeau) distinguish *subcutaneous phlegmon*, *retro-mammary phlegmon*, and *parenchymatous mastitis* or abscess. It is not uncommon however for inflammation to spread from one anatomical region to another, and thus simultaneously to implicate several regions.

§ 824. *Cutaneous and subcutaneous phlegmon may be limited to the areola, or be diffuse.* The former (*areolar*) variety sometimes begins with the inflammation of a few sebaceous follicles, which give rise to small furunculi, these in rare cases remaining isolated, but as a rule coalescing to form a single small abscess. The diseased areola is dark-red, swollen, and considerably raised above the surrounding region; it is extremely sensitive on contact, and of course during suckling. The general health of the woman is usually but little affected. In rare cases the inflammation ends in resolution, but suppuration is almost invariable. The small abscess cavity may then communicate with the milk ducts, and discharge through the latter with the milk, so that the child, when it sucks, swallows pus at the same time.

Phlegmon, not affecting the areola, may either spread out quite superficially, like erysipelas, or extend deeper into the subcutaneous layer of fat; not infrequently it is merely a continuation of the parenchymatous mastitis. The appearances are the same as those of phlegmon in other parts of the body, and the termination is usually rapid. Unless the inflammation rapidly disperses, suppuration follows. With simple phlegmon there is as a rule only one large abscess, which opens at, or close to, the nipple, usually at its lower margin; more rarely it does so at the lower edge of the gland.

§ 825. *Retro-mammary or sub-mammary phlegmon, paro-*

mastitis, is the rarest form of inflammation. It may have a mechanical origin, but as a rule it arises from an extension of the inflammation from the deeper glandular lobes; it is the exception for it to be secondary to inflammation of the thoracic parietes. The phlegmon is always diffuse. The whole mamma and its immediate vicinity are swollen, the organ appears enlarged, and feels as if raised from its substratum; indeed the mamma is resting on a soft, elastic, infiltrated floor, and, if pus has formed, may fluctuate, since it is floating on the layer beneath it. In these cases the skin is scarcely reddened at first, but merely tense and shiny. The gland itself is but little sensitive on moderate contact, but firm pressure and displacement cause the most acute suffering. The constant pain is deep-seated, dull and boring in character. Movement of the arm is rendered difficult, the axillary glands being much swollen. The inflammation may spread far beyond the margin of gland, as well as deeply, *i.e.* into the wall of the chest. The lacteal secretion is not disturbed any more than with subcutaneous phlegmon, provided the substance of the gland itself is not implicated. The rise of temperature however is always very great and persistent, and lasts, until the as a rule speedily formed pus has been discharged. The pus usually travels downwards and outwards; but it is rare for it only to take one track, unless a deep and free incision has been made; generally speaking several fistulous apertures form in succession. The latter condition is especially common, where progress is slow, and where several lobes of the gland are simultaneously affected. Under such circumstances, the inflammatory process may be very tedious, and greatly debilitate the patient, on account of the difficulty of exposing the actual centre of the inflammation, and of thus definitely cutting short the suppuration; the fever is usually moderate but persistent. Indeed if the pus bores its way and bursts in an unfavourable direction, there may be danger to life.

§ 826. *Inflammation of the gland itself* is the commonest variety. It may either start in the *interstitial connective tissue*, spreading from the diseased nipple and being conducted through the lymphatics; or it may start in the *milk ducts*, the pyrogenic material leading to purulent catarrh, which creeps from lobe to lobe by means of the lacteal sinuses. The latter mode of origin

is especially supported by the fact that the inflammation is so frequently limited to individual lobes, but as a rule both processes probably occur side by side. The glandular inflammation is shown by the active proliferation of epithelial cells, and by the distention of the glandular alveoli and ducts with a multicellular, finely granular substance; the interstitial by the presence around the acini of numerous lymphatic corpuscles, and by the purulent disorganisation of the surrounding tissue. This peri-adenitic swelling blocks the milk ducts, even if they were not primarily diseased, causing the centrally lying portions to become distended with secretion; the substances produced by the inflammation, may then pass through the so greatly attenuated walls into the actual glandular acini, and cause them to participate in the process, unless indeed the pus, that has formed, actually pierces the wall from without, and thus comes into direct communication with the milk ducts.

It is rare for the entire gland to be affected at once; individual parts are usually so at first. As the whole gland grows tense, the affected lobes swell up into hard, tender nodules, which however soon become more diffuse, through the interstitial tissue over a wide area, and the superficial subcutaneous connective tissue sharing in the infiltration. The pain is very great, the fever high, and not uncommonly the disease begins with a severe rigor and acute gastric symptoms. When suppuration begins, and until the pus is discharged, these symptoms usually grow still severer. Such discharge may sometimes occur rapidly, if the nodule is placed superficially. If the inflammation however is deep-seated, there may be a long delay, before the phlegmonous tissues have broken down, and until the abscess has made its way to the surface. To this must be added the fact that not uncommonly there may from the first be several suppurating centres, which break down into pus and come to the surface at varying rates. And further (as also not infrequently happens) some inflammatory swelling may press on a large milk duct, and provoke fresh mischief in the area belonging to this, so that one abscess follows another, each one leading to fresh perforations. Again, through the agency of the lymphatics, retro- and para-mammary abscesses may also show themselves, and these are frequently very insidious in their progress. Velpeau once

saw a single mamma riddled with 52 collections of pus. The affected lobe ceases to secrete milk. If pus makes its way into one of the larger milk ducts, it mingles with the milk, and exudes from the nipple at the same time, or can be squeezed out of it; again, as is still more often observed, owing to this communication at the external point of perforation of the abscess, a *lacteal fistula* may remain, which is usually not easy to get rid of. The pain and the deficient supply of milk usually make nursing impossible; the irritation moreover which the latter causes, does harm to the mother. From the child's point of view the admixture of pus with the milk is particularly undesirable.

It will be gathered from the above remarks, that an early termination can only be looked for, where a single large abscess cavity has formed, which can discharge its contents freely and without hindrance. Where, on the other hand, there are several centres, where the pus exudes through a long devious channel and a small opening, and the fistula is frequently obstructed, progress may be very slow. Indeed the case may drag on for months, if one abscess forms after another, and the stagnant pus breaks through at fresh points and in unfavourable directions; one of Velpeau's cases lasted 8, another 6, and several 3 months. (Generally speaking however, the prognosis is not unfavourable, although the woman may be brought into a very wretched and low condition. It is quite the exception for death to occur through septicæmia; but the protracted suppuration is apt to reduce to the lowest level women who are decrepit or of unsound constitution, as well as to provoke dormant germs of disease (tuberculosis) to a fatal activity.

The substance of the breast may be totally destroyed as a result of extensive suppuration, entire lobes sloughing and being discharged. As a rule deep cicatrices are left, and round them there is frequently more or less extensive, fibrous induration, caused by deficient resorption of the previously infiltrated and hypertrophied connective tissue, and by glandular hyperplasia. Sometimes cysts are formed, through the dilated gland ducts being constricted off by the proliferating stroma, and they may contain still milky, or serous, or inspissated, cheesy contents; occasionally too the pus of a small abscess may become inspissated, and remain as a cheesy or chalky residuum, or else

develop into a cyst. The extent of these sequelæ will determine whether the diseased gland can again become functional during a subsequent lying-in state; if the mischief has been limited in extent and is followed by rapid recovery, such return to activity is not uncommon, although a lobe, that has once been affected, shows a strong tendency to recurrent inflammation.

Lastly, I must mention that the cases, in which *abscess of the mamma* is a part of *general septic infection*, must be very few, judging from the rarity of the instances on record. Rokitansky mentions the occurrence, M'Clintock (*l. c.*, p. 325) relates a case, Scharlau met with another in the *clinique* at Berlin (*Berliner Klinischer Wochenschrift*, 1861, i., p. 192), and I have had one case here (*Clinical Records*, 1865—6, No. 186). This form of sloughing either shows itself as a metastatic, diffuse, parenchymatous inflammation (this is especially met with in the phlebitic form of puerperal fever, indeed all the quoted instances occurred under such a condition), or else it begins as a diffuse, phlegmonous erysipelas, starting from the nipple.

Treatment.

§ 827. The importance of appropriate *prophylaxis* has already been sufficiently dwelt upon, and I have mentioned the measures to be adopted. Actual *treatment* of mastitis must be based on the same principles, that hold good for phlegmon and acute abscesses in other parts of the body. An attempt may be made to arrest the inflammation by careful dieting, purging, and local antiphlogistic measures; by supporting and fixing the breast. If suppuration is clearly unavoidable (as is usually the case), moist and warm applications will be called for; the suppurating centre should be opened as early as possible, and kept constantly empty, the whole treatment being strictly antiseptic. If indurations remain, compression and absorbent agents will be required.

With *subcutaneous* and *submammary* phlegmon, the breast should be supported by a broad bandage, carried beneath it and over the shoulder of the healthy side; the tension may be diminished, by smearing the skin with some fatty substance, and applying an ice bag; leeches are useless in all forms of mastitis. Every time that the ice bladder is changed, the breast may be emptied of the accumulated milk, if possible by the child; if not,

by gentle and uniform pressure. But as a rule the cold applications temporarily diminish the secretion, a disadvantage which is of no great consequence, since it need not, provided the inflammation rapidly subsides, prevent the breast from being again used afterwards. If the inflammation does not subside, there will soon be indications of the formation of an abscess. The ice bag may then be replaced by a thick, warm water compress, which is covered by some water-proof layer (gutta-percha tissue). The compress (after being soaked in luke-warm water, and moderately well squeezed out) ought to cover the whole inflamed region, and extend some distance beyond it, the water-proof layer overlapping still further, and lying everywhere in firm contact with the skin. This application keeps the breast at a uniformly warm temperature, indeed in a warm bath, and need not be renewed more than 3 or 4 times in 24 hours. It is more cleanly, lighter and more convenient than the ordinary poultice, and does not cause the unpleasant alternation of heat and cold, nor can it scald the skin, as every one must have seen happen with poultices.

A *subcutaneous abscess* can always be opened early and freely. Where possible, it is well to avoid the areola, since the resulting cicatrix may lead to retraction of the nipple, and to consequent difficulty during future suckling. In any case the incision must be radial in regard to the nipple, so that unnecessary injury to the milk ducts may be avoided. *Submammary abscesses* are best opened at the lower or outer border of the gland; if there is much delay, before they "point" in that direction, or if there is reason to suppose that pus is present at any one spot, an exploratory puncture (the needle being pushed in parallel with the lower surface of the gland, the latter having previously been as far as possible raised from the thoracic wall) will settle the question. A deep free incision must then be made, until the pus is reached; a counter-opening should, when necessary, be added, and drainage tubes inserted,—antiseptic precautions being, as already mentioned, carefully carried out.

§ 828. *Parenchymatous abscesses*, especially when deep-seated, are the slowest in revealing themselves; indeed the case may be most tedious, where there are a number of small suppurating foci in, and around, the inflamed nodule. Under such circumstances warm and moist applications must be persevered with even longer, although not until the layer of tissue, which covers the

abscess, has thinned, and the pus is at the point of bursting through the skin; this would involve too much delay, and, what is still worse, the disorganisation of the tissues would be needlessly extensive. Nor can the pus always be induced to travel in the desired direction; it may at the same time be taking a favourable, and a mischievous course, *e.g.* away from the surface, or burrow round the outskirts of the gland. The best plan is to make an incision, as soon as the presence of pus is shown by distinct fluctuation or by soft spots surrounded by œdema, the so-called gaps in the tissues (*Gewebslücken*). The incision must always be large enough to allow the operator to introduce his finger easily into the pus-containing cavity, and to enable the pus to escape freely on all sides. If any *cul de sac* is found, which does not, or does not freely, communicate with the opened cavity, the intervening layers of tissue should be broken down with the finger, or one or even several counter-openings may be made. By means of gentle pressure, all the pus and shreds of tissue may now be removed, after which drainage tubes should be introduced into the wound, and cut off close to the surface. An incision into an inflamed breast causes acute pain, and, since it often lasts some time, chloroform should be administered. The hæmorrhage may be very considerable with deep incisions, and must be checked, before the bandages are applied; if this is not possible, on account of its oozing character, a provisional bandage, consisting of a new and carbolised, large bath sponge, of a thick gauze compress and a gauze bandage, may be applied for the time being, the permanent bandages being substituted after about 12 hours according to Listerian principles. The last bandage must immediately be changed, if the wound secretions make their way outwards at any point, and if the patient observes this before the arrival of her doctor, she should at once cover the spot with a fresh gauze compress. It is rarely necessary to change the bandage frequently, if the antiseptic method is adopted; as a rule once in 2 or 3 days will suffice.

Recovery now takes place remarkably rapidly. The wounds quickly close, the inflammation and suppuration cease to spread. The pain and fever also soon subside, while the woman's general condition improves in a corresponding manner. How very different is this result, from what happens, when the old method is still used: incision, followed by warm and moist fomentations,

and by compression ! It is then a long tale of recurrent abscesses, of protracted suppuration, of deep glandular and milk fistule, which compel fresh incisions and counter-openings.

Whether the healthy breast can be used for suckling during the progress of the disease—of course the affected one cannot—depends on the conditions of the individual case. As a rule nursing is prejudicial, if not impossible, owing to the disturbance of the general health, and to the afflux of blood into the diseased breast, which accompanies the suckling. With the antiseptic treatment moreover children decline the breast, on account of the smell.

Persistent, inflammatory infiltration and induration yield most readily to firm compression ; and this is best produced with a firm, gauze bandage, carried in circular or figure-of-8 turns round the chest. This bandage fits closer than any other, but unhappily it not infrequently interferes with free respiration, or at any rate appears to be very unpleasant to the woman on that account. Internal absorbent agents cannot be advised ; but as local remedies, inunctions of mercury and iodine, combined with extract of belladonna or of conium, and with camphor, are useful ; liniments of iodoform are so also.

d. Galactocoele.

§ 829. The *milk tumours*, which form during lactation and are called *galactocoeles*, have nothing whatever to do with new formations, but are retention cysts, *i.e.* dilatations of the portions of the efferent ducts (both of the lacteal sinuses, and of the larger milk ducts) which lie nearest to the nipple ; they arise from an accumulation of milk, caused by the blocking up of those efferent ducts. One or more sinuses and ducts may be affected ; and the sac may therefore either be simple, or consist of several divisions. Its mass is either of roundish form and closed on every side, the lumina of the small milk ducts that open into it, having been compressed by the large cyst ; or also it forms a sac with diverticula, if the dilatation extends to some of the nearest ducts. The tumour is usually as large as a hen's egg or a fist ; but it may reach an enormous size, when the central glandular portions continue for a time to secrete, and pour their secretion into the sac.

(In the frequently quoted case of Scarpa (*Opuscul. de Chirurgia*, vol. ii.), the tumour had a circumference of 34 inches, and, when the woman was seated, reached down to her thighs, 10 lbs. of milk being removed by puncture.)

Sometimes the skin atrophies, in consequence of the tension to which it has been subjected, and gives way simultaneously with the sac (A. Cooper); in other cases the wall of the sac gives way within the mamma, into which the milk is then extravasated. Inflammatory processes, ending in ulceration, are apt to follow the last-mentioned event, especially if the contents of the cyst consist of no longer pure milk. The latter condition is to be explained by the fact that in process of time the milk undergoes changes; it becomes thick and cheesy, or else divides into a serum, and into a firm portion which adheres to the cyst wall, and which may give rise to an incrustation. Hence too it happens that we sometimes find the contents of the tumour to be mainly serous, sometimes buttery and cheeselike, sometimes sanguineous.

The *diagnosis* depends mainly on a knowledge of the time at which the tumour originated, and is usually easy, if the patient has been under observation from the first. Under other circumstances it may be difficult; only very rarely can it be possible, as Brodie states, to squeeze some of the contents out through the nipple. An exploratory puncture will decide the nature of the tumour. The immediate *treatment* consists in evacuating the cyst. As a rule however it fills again after puncture, and if so, the obliteration of the sac may be effected by irritating injections, or still better and more rapidly by an immediate free incision into, and excision of a portion of, the wall. Both operation and after treatment must be carried out antiseptically. If a woman with a galactocoele is still nursing, she must of course at once wean the child.

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5. Puerperal Insanity.

§ 880. Mental disorders show themselves at every stage of the puerperium, from the beginning of pregnancy right on to lactation, and each stage is characterised by a preference for particular forms of illness. I have however postponed their description until now, for the reason that the disease is commonest during childbed. Its absolute frequency is difficult to determine, at any rate from the statistics of lying-in hospitals, owing to the fact that the patients are usually discharged from those institutions in the second week after confinement, while a large proportion of mental disorders only develop at a later period, and that a pregnant woman, who in suffering from such a disorder, is thereby usually rendered ineligible for admission. Amongst the patients of lunatic asylums, the puerperal forms constitute about a 12th part = 8 p. c.¹; but of course these institutions only receive the severest cases.

The psychical disorders, which occur during the puerperal state and bear some causal relation to it, do not present any specific characters, either as regards symptoms or mode of onset, any more than do most of the physical disorders which complicate the puerperium. I may however point out that, generally speaking, the prognosis is good; and especially that (since it points to an intimate ætiological relation between the two) the psychical affection frequently terminates at the same time as the lying-in state. *But the ætiological relation is highly complex.* In any individual case it is usually very difficult to assign the exact influence which the puerperal processes have on the mental disorder, and of course it would be going too far to assert that there is any *necessary* ætiological connection. As a rule those processes only form one link in a long chain of injurious influences, both causal and predisposing; they either strengthen the inherited psychopathic tendency, or else merely intensify a disorder, which has

¹ This ratio is taken from the statistics collected by Marcé (*l. c.*) and Scanzoni (*Klinische Vorträge von Kniech.* iii., 527). Esquirol found 92 cases of puerperal psychoses out of 1,119 = 8.1 p. c.; Tuke 155 out of 2,181 = 7.1 p. c.; Holm 145 out of 1,266 = 11.5 p. c.; Weber 117 out of 975 = 12 p. c.

Amongst the puerperal forms there occurred during pregnancy, childbed and lactation respectively: according to Tuke 15, 47 and 36 p. c., according to Marcé 8, 56 and 33 p. c., according to Weber 15, 58 and 26 p. c.

been provoked by some entirely different cause. Almost all authors assign to *heredity* a primary role amongst the causes, and Arndt, in an excellent essay, has shown that no psychoses show themselves, unless some psychopathic predisposition previously existed in the individual. On the other hand we must not underrate, from an ætiological point of view, the great influence of the changes, which the reproductive processes provoke not only in the sexual apparatus, but in the whole organism, in the blood, tissues and nerves, nor the excitement, which arises from anxiety for the future, from the pains of labour and from the demands on the woman's strength which are made by labour and by the events of the post-partum state. We can see this influence, even during pregnancy, in the numerous slight disorders, which occur within the limits of health, and are therefore still physiological. Indeed well marked hysteria is a psychosis, whose causal connection with the sexual organs is proved by its almost exclusive occurrence in the female sex, in which the sexual functions govern the psychical condition in a widely different manner than they do in the male. But that the predisposition after all continues the pre-eminent agent, is shown by the fact that the injurious influence of the exciting, i.e. the puerperal, factor, bears no direct proportion to the severity with which the puerperal changes manifest themselves in the particular organism.

The above remarks will show that, for *prophylaxis* and *treatment*, it is necessary to study the individual relations of each case. A woman, who has a well marked predisposition, should be forbidden to marry; if she becomes pregnant, she should be kept well nourished. Strengthening medicines and tonics are of prime importance, where the disorder has broken out, although of course any local conditions, that may act as sources of irritation, should be attended to. Narcotics should not be resorted to without careful consideration; morphia and chloral hydrate ought not to be given too early, and then only exceptionally; their continued use does not remove the real mischief, while the patients soon get accustomed to those remedies, and in the end are injured by them. Moral treatment is of the utmost value; where possible therefore, the women should early be placed in an asylum.

a. During Pregnancy.

§ 831. The *melancholic variety* predominates during pregnancy. Amongst 32 cases of insanity in pregnant women, Ripping only met with 5, while Tuke out of 28 had only 2, of well marked mania. It is probable that every one of these women who suffered from pure mania, had been previously affected in a similar manner, that pregnancy therefore merely led to a renewed outbreak. Melancholia very frequently begins as a physiological depression, as hypochondriasis; consequently it mainly shows itself during the first half of pregnancy, and is as a rule slighter, and the prognosis is better, the earlier the attack breaks out, and the more distinctly it assumes the order of development just mentioned. The most serious and protracted cases are invariably those, which do not develop until the *last* months, or those to which pregnancy was incidentally superadded. In harmony with the above-mentioned connection moreover, is no doubt the fact that primiparæ present the largest contingent, and that advanced age predisposes. But the psychopathic predisposition is very clear. Ripping was able distinctly to prove an inherited tendency in 15 out of 32 women; Tuke in 12 out of 28 cases; Fürstner discovered it 9 times in his 32 cases, and found severe neuroses in the relatives of 11 others. It not uncommonly happens, nor is it surprising, that the same woman is attacked during several pregnancies.

Melancholia during pregnancy (and indeed natural pregnancy not uncommonly is so too), is frequently associated with strange impulses. Even attempts at suicide are not rare, and, if the disease continues after delivery, the child is the special object of such tendency. Recovery before parturition is rare in severe cases; and where it occurs, relapses after delivery are common. Occasionally recovery has been observed to take place at the moment of delivery. The actual course of pregnancy is unaffected.

The prognosis is only good with a mild attack; it is bad with a severer one, with mania, and where disease existed previously. A stay in an asylum, set apart for mental cases, is very beneficial, owing especially to the regular dieting of the woman, to the supervision, and to her withdrawal from many sources of excitement, which arise during family life.

b. During Delivery.

§ 882. The nervous excitement, by which delivery is sometimes accompanied, may be so intensified as to pass into an attack of transitory alienation, in persons who bear pain badly or are very sensitive, and, according to the individual diathesis, lead to temporary unconsciousness or to maniacal delirium. These *transitory* conditions (*acute delirium*) are mainly observed, in cases where strong and long continued pains follow rapidly one upon the other, maintain the parturient woman in a constant state of exertion and unrest, and scarcely allow her a moment to recover and collect herself. Moreover they usually, as would be expected, occur during the most painful stages of delivery, *i.e.* during the final dilatation of the os uteri (where its edges are stretched to the utmost), and the exit of the head from the vulva. Now and again too immediately after the expulsion of the child, a short period of unconsciousness or a condition of despair, associated with attacks of frenzy, supervenes, in cases where the preceding pain was not given way to. Further, it is easy to see how attacks, arising from such a condition, may be directed against the supposed origin of the pain, *viz.* the child. This transient mania is of forensic importance, inasmuch as it is those women who have been delivered in secret, that are most apt to be placed in the circumstances referred to.

I need hardly add that, whenever a case of this kind is met with in a parturient woman, she should be rapidly delivered. If this is not possible, the pain and excitement should be soothed by narcotics.

c. During the Post-partum State.

§ 883. Insanity is most common during the post-partum state, as was mentioned above (§ 880), even if, as is of course natural, the *symptomatic* conditions of mental exaltation, which accompany general febrile disorders and are in reality nothing more than febrile delirium, are excluded. Indeed that the greater frequency during childbed is not merely accidental, that the lying-in state is really an important provocation, is shown by the fact that almost all attacks break out during the first weeks¹. In this

¹ Esquirol states that out of 81 cases not one occurred after the 15th day. Rappaport found ca. 70 p. c. in the first fortnight; Tuke out of 78 cases saw only 2 commence after the elapse of a month.

respect the second half of the first week seems especially dangerous; according to Fürstner, the interval between the 5th and the 10th day is so.

The influence of heredity is by no means slight, more particularly if the heredity lies on the female side of the family. Indeed it is not too much to say that the inherited forms of insanity in women do not usually break out until childbed. Moreover the time of the outbreak is, according to Ripping, determined by heredity to the extent that the latter favours an early attack. Additional important ætiological factors are furnished by abnormalities during, and soon after, delivery. These abnormalities act in various ways; partly by the pain and exhaustion and especially by the hæmorrhage, which they produce, partly by the co-existing psychical disturbance. The influence of eclamptic attacks has already been referred to; but Simpson was in error when he ascribed to albuminuria a particularly large share in producing psychoses. Some strong emotion is very frequently the immediate provocation to an outbreak; Esquirol was able in 46 out of his 92 patients to discover such a factor, and the influence of the affections on the development of psychoses is well known. But the principal agent amongst the emotional disorders is undoubtedly the death of the child; such death preceded the outbreak in 12 out of Ripping's 82 cases.

In former days, great weight was laid on the diminution and cessation of the lacteal and lochial secretions, but this was a mistake. When these discharges cease, the cause lies in the same condition that has led to the appearance of the psychosis; or else it bears no relation whatever to the latter.

§ 834. The majority of the attacks take the form of *mania* (57 out of the 73 cases mentioned by Tuke, did so), and are characterised by the suddenness with which the first violent symptoms appear; these rapidly lead to complete aberration, and are accompanied by great muscular excitement and vivid sensory illusions. This condition is then not uncommonly suddenly interrupted by a stage of apparent stupidity, which however only affects the outward behaviour of the woman, who during it takes no note of what is going on around her. Sometimes however this stupor lasts a long time, and passes into a state of catalepsy. But here too there may be illusions of the senses, and these, as well as occasionally external provocations, are apt

rapidly to modify the existing condition, and again to provoke great muscular excitement. It is obvious that these attacks present many points of resemblance with severe hysteria; while on the other hand the frequent maniacal attacks, and the numerous hallucinations strongly simulate epileptic madness, and sometimes also the cerebral excitement of delirium tremens. The disease usually begins with a slight rise of temperature, which however soon subsides; during the further progress of events the contrary condition, viz. diminished metabolism, takes its place. There is frequently obstinate constipation.

Melancholia and *intermediate forms* present nothing special in the way of symptoms, compared to the disease at other times; moreover they are usually dependent upon, and developed from, conditions which have long been in course of preparation. I might however mention the great excitement of the sexual organs, which is sometimes observed, and which leads to violent masturbation movements.

The *prognosis* of the psychoses of childbed is more favourable than that of any other puerperal forms, both as regards the duration of illness, and as regards complete mental and physical recovery. Puerperal mania in itself is not fatal, and yields a better prognosis than does the melancholic, the more so, the earlier after delivery it broke out. Those cases, which terminate favourably, usually last a shorter time than do the psychoses of pregnancy. Many of them terminate after some days, or in a couple of weeks; it is rare for the disease to last more than 3 months. The statements, that are sometimes made of a greater average duration (8 months), are taken from mad-houses, to which only the worst cases are taken. Indeed even when the duration is very great, the prognosis is not unfavourable, provided that the system has not been too much shattered, and that the outbreak, which developed during the puerperium, is only the last manifestation of the disease.

Menstruation usually returns before convalescence sets in, in the cases that do not end very rapidly, and appears sometimes to have a beneficial influence on the progress of events; moreover it usually indicates a favourable state of nutrition. On the other hand the menses may remain absent, even when the woman recovers.

Treatment must aim at counter-acting the original cause, the psychopathic diathesis, and at removing all exciting conditions. Digestion should be kept in order (daily defecation is very important), good nourishing food must be given, the excited brain must be soothed, sleep procured, and any secondary physical disturbance, such as might arise from uncleanness (*et.c.* due to the decubitus) or from the refusal of food, must be avoided. The best line of treatment will soon be discovered, if the case is studied in its individual development. Tepid baths with, or without, cold affusions to the head or to the whole body, may have a very soothing effect. The practitioner should be very shy of narcotics, as indeed I have already advised (§ 830). Their prolonged administration may lead to a state very similar to dementia; only as an occasional resource therefore should they be given, being discontinued, if not rapidly beneficial. *Morphia* is on the whole better borne than *chloral hydrate*, and, in combination with *quinine* or *digitalis*, is frequently valuable. *Digitalis* does most good, where the action of the heart is irregular, and the pulse is small and soft; moreover it often acts as a good soporific in hysteria, when given in small doses. In regard to *lactate of sodium* as a soporific in psychoses, we have at present only negative results (*cf.* Kroemer, *Deutsche Medicinische Wochenschrift*, No. 15, 1877). On the other hand *potassium bromide* (or *sodium bromide*, if it is desired to avoid the influence of potassium on the heart) is sometimes useful.

On account of the great benefit, which attends moral treatment, the friends and attendants of the woman should be early instructed as to their conduct. In obstinate cases it will soon become necessary to place the patient in an asylum, since the desirable conditions can scarcely be carried out at home.

d. During Lactation.

§ 835. Insanity during lactation is mainly caused by the debility and exhaustion, that accompany suckling, and therefore depends to a great extent on cerebral anemia. As a rule however the case will be one of relapse. On the other hand the presence of local disease about the generative organs has an unusually powerful influence during this period.

Psychoses are more common during lactation than during pregnancy, and as a rule begin between the 6th and the 10th week after delivery, i.e. just at the time when, under normal conditions, the systemic loss that accompanies delivery and childbed, is usually again made good (Ripping). Melancholia is the commoner form; mania, when present, runs a much more rapid course than during the lying-in state. The prognosis is hopeful, provided the patient is early got under proper treatment. It is all the better, the shorter the period during which (apart from the debilitating effect of the puerperal processes) suckling has been in operation, i.e. the sooner after delivery the psychosis commenced. The proper treatment may be gathered from what has already been said on the subject.

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6. Traumatic Diseases, Puerperal Fever.

a. Pathology and Etiology.

§ 836. The fevers of childbed are not only the commonest, but also the most serious and dangerous, of the sequelæ which directly arise from the processes of labour, and affect the lying-in woman. They, more than anything else, determine the morbidity and the mortality of childbed; and that such mortality is high enough, is shown by Matthews Duncan's shrewd estimate, which indicates an average of one death out of every hundred confinements.

The great interest, which has always attached to puerperal fever, is shown by the numerous theories and hypotheses which have been suggested, in regard to its nature and relation; indeed a whole library has been written on the subject.

discuss those theories here is beyond the scope of my book, but they present a true picture of the fluctuating views, that have been held in regard to general pathology, which views have always been reflected in the theories, that have been in vogue at the time. The desire to prove that puerperal fever, arising from the puerperal state, was a specific fever, has been the chief reason why so many years have elapsed, before the light which has been thrown on the nature of traumatic diseases, both by eclectic and experimental methods, has been admitted as also explaining puerperal fever. Not so very long ago the accoucheur was as a rule too exclusively a specialist, not unconsciously to be driven to regard the diseases, to which his special clients are subject, as something entirely *sui generis*.

To Semmelweiss belongs the honour of having first pioneered the researches, bearing on the nature of febrile puerperal disorders, into the new and true channel, although several Englishmen (Willis, Denman, van Swieten), followed by Eisenmann, had long ago pointed out the way, without however finding adherents. Semmelweiss came forward in 1847, and declared that every case of puerperal fever was to be regarded as an absorption fever, caused by the introduction of some decomposed animal matter, whether this was conveyed to the patient *ab externo*, or had developed in her own body (auto-genetic). These statements are in the main accepted to-day; broadly speaking they contain everything that we can say, as regards the origin of puerperal fever. And since the infecting matters can only be absorbed from an injured surface, *i.e.* from a wound, puerperal fever comes to rank as one of the common traumatic fevers, including under that term all the phenomena that affect the organism in consequence of local traumatic inflammation, and of the local operation and absorption of septic matters. The febrile puerperal disorders are therefore *traumatic diseases*, and *puerperal fever is a septic intoxication* (in the widest meaning of the word "septic").

Unhappily this doctrine of the origin and propagation of puerperal fever has not yet been accepted by all obstetricians. To this day it is combated by many, especially in non-Germanic countries. Its consequences in particular have not yet been clearly realised, a neglect to which many lives, which might be preserved, are still sacrificed.

§ 887. The *physiological traumatic condition*, which is associated with delivery, is well known. It not only involves the whole body of the uterus, whose superficial layer of tissue has of course been shed, whose lymph channels have therefore been opened, and in which there are open veins at the placental area; but it affects the cervix also, the portio vaginalis, the lower portion of the vagina, especially its perineal region, and the vulva, slight abrasions and tears of which must be included amongst the ordinary sequelæ of delivery; above all, the narrowest portions of the parturient canal, *i.e.* the os uteri and the vaginal introitus, scarcely ever remain intact. Even the loss of epithelium, which so often occurs at the edges of the softened cervix, owing to a somewhat rough and especially a repeated examination, has a very important relation to the diseases in question. How common such loss is will be easily ascertained, if a pregnant woman, who has recently been somewhat roughly examined with the finger, is subjected to an examination with the speculum!

To these regular injuries it is not rare for much severer ones to be super-added. The uterine mucosa may be deeply scratched and detached over a varying area during intra-uterine operations. There may be laceration and extensive bruising of the cervix, vagina and vulva, or contusion and local crushing of the parametric and still more distant pelvic connective tissue. These lesions may occur, whenever there is mechanical disproportion (whether this is overcome spontaneously or artificially); but they are most common with severe instrumental extractions.

§ 888. Let us for a moment consider the processes that take place, and the development of the (accidental) diseases that start, in a wound.

Every wounded tissue is necrotic at the seat of injury. Around this an inflammatory reaction sets in, which extends to a variable distance into the vicinity, getting weaker, as the distance from the wound increases. This inflammation, by means of the migrating cells which absorb the necrosed particles, and especially by the production of new vessels, assists in getting rid of the necrotic tissue, and thereby at last forms the cicatrix. The tissues do not slough off, even where they have been severely bruised, but are absorbed by the neighbouring reactive inflammation. If on the other hand *putrefactive germs* get into the wound, the injured tissue dies as a result of the operation of

those germs; the latter provoke suppuration of the wound, and the absorption of the substances that are thus produced, causes traumatic fever¹.

It seems that, under quite exceptional conditions, suppuration may take place without the presence of those germs, namely when the wound affects a very debilitated person. The best example of these exceptions are the injuries, which occur in women suffering from Bright's disease, and the suppuration may there be explained by the primarily diseased condition of the blood and especially of the blood-vessels. Such cases however require further investigation, and, owing to their rarity, need hardly be considered here. Even a powerful chemical irritant is capable of provoking severe suppuration, without the co-operation of any micro-organisms (Uskoff, Virchow's *Archiv*, vol. 86).

A very different effect is produced, when the so-called "septic" poison is introduced into a fresh wound and infects it, or when such poison is first developed on a suppurating surface. Such virus is of an entirely different nature from that which accompanies simple putrefaction; at any rate it acts in a totally different manner. It is not destroyed by the living tissues, as ordinary putrefactive germs are, but spreads from the point of entrance far into the system, and usually multiplies in the latter. It may spread in various ways. (1) The poison may be introduced in so large a quantity or be so virulent, as rapidly to decompose the fluids and blood of the body, and consequently to paralyse the activity of almost every organ, so that no reaction shows itself by cellular new formations, or by local inflammation; this variety constitutes pure and very *acute septicæmia*. Or else (2) the poison extends peripherally through the connective tissue, which surrounds the seat of infection, in which case the serous canals and lymphatics act as its main channels, and convey it into more or less distant regions, where it again and again gives rise to fresh inflammation; this variety is called *lymphatic septicæmia* or *progressive phlegmon*. Or again (3) the absorption may occur by means of the veins, leading to what is termed *phlebotic septicæmia*. The lymphatic form of septic disease is the commonest, and it must be noticed that the regions that are secondarily involved, frequently suffer more severely than that which was the primary seat of inoculation. This in part depends on the virulent nature of the transported matters, and in part on the idiosyncrasy of the infected organism.

¹ Aseptic traumatic fever may also occur, without the introduction of putrefactive germs into a wound (Grenzner and Volkmann).

§ 839. *The above sketch contains in the main the history of the development of puerperal febrile diseases.* If we were able to shield the puerperal wounds from every external influence, suppuration in such wounds would be just as rare as it is on the surface of the body, when proper precautions are taken; deep perineal tears, ruptures of the vagina and of the portio vaginalis would generally heal *per primum intentionem*. Indeed this sometimes actually happens, especially with injuries lying high up in the parturient canal; we then merely get a moderate degree of inflammation (due to absorption) round the wound, without any, or with only very moderate, pyrexia, and nothing remains in the end except a cicatrix. What accoucheur cannot recall instances in which, without any distinct signs of disease having appeared, patches of condensed tissue and tough bands (resulting from some simple local traumatic reaction which has been accompanied by hyperplasia) have afterwards been discovered round the genital canal, and in the parametrium?

The fact that it is almost always impossible to protect puerperal wounds against putrefaction germs, explains why we so frequently get suppuration. On the one hand, the wounds in the lower portion of the parturient canal are freely exposed to the action of all the putrefactive germs which reach it from without (and I need not stop to prove that such are always contained in the air of the lying-in chamber, in the bedding and coverings of the parturient, and still more of the recently confined woman). On the other hand, the various injuries are constantly bathed by the wound products from the uterine cavity, *i.e.* by the lochial secretions; moreover those secretions are almost always more or less decomposed, since germs are conveyed through the air into the genital canal during delivery, and those which have penetrated into the lower region subsequently extend upwards. The *lochia* in themselves are of course no more septic than the secretions from any other simple wound; nor does the fact that, when introduced under the skin of a healthy animal, they cause inflammation and fever (Kehrer), prove them to be of a specially dangerous nature; since the most innocent wound products do the same. If the *lochia* were so very dangerous in themselves, we should never get a healthy post-partum state. When however they contain putrefactive germs—and we have seen how often they do so—they involve danger to all the wounds from

the cervix downwards, through the suppuration they provoke, for the reason that these wounds are in constant contact with the lochia, and may literally be bathed in it, where the secretion is copious and stagnates in the vagina. They are much less injurious to the uterine mucosa, while constantly flowing down over it; but should they cease to do so, they will act on it in the same way that they would on the parts lower down. At any rate that mucosa can absorb chemical products of decomposition.

By this operation (which we are often powerless to prevent) of putrefactive germs on the puerperal wounds, we can quite easily explain the great frequency of suppuration. Indeed inasmuch as those germs, in the case of deeper tears, can penetrate into the bottom of the injury, i.e. to some distance into the deeper tissues, the frequency of parametric suppuration is also accounted for. Putrefactive germs however are destroyed by healthy tissues, and by cellular new formations, so that none of the disorders, which arise in the manner just described, can ever develop into general inflammation and suppuration. For the occurrence of these latter (with the possible exception of the septicemia which is referred to below, § 841, and which is produced by the transportation of simple decomposed thrombi and by the prolonged absorption of putrid products), another poison is necessary.

Now this virus may either be derived from without (as usually happens), or else develop on the actual suppurating surface. Under what conditions it does the latter, is quite as unknown to us, as is the true nature of the virus. Most probably however it penetrates from without, even in many cases in which we usually suppose that it has been primarily formed in the secretions of the wounds. It may have been introduced in very minute quantities into the genital canal, where, finding an admirable nutrient material in the lochial secretions, and especially in the decomposing remnants of tissue, it then multiplies, and leads to infection. Nevertheless the development of the poison in the parturient canal itself appears to be more common than used to be believed (*vide* § 841).

But at any rate the worst cases of septic infection (infection due to inoculation) and of acute septicemia are, broadly speaking, produced by infection from without. In such therefore the wound is usually primarily infected. The inoculation generally

occurs during labour itself, especially at the region which is subjected to the longest and severest pressure and contusion, viz. the cervix. This statement as to the time of infection is supported by the observation that most of the serious, and especially the fatal, attacks begin as early as the first or second day of childbed, sometimes a few days later, but very rarely after the 6th or 7th day. The varieties of these septic diseases in the puerperal woman are as a rule the same as those that have been mentioned in the foregoing paragraph.

§ 840. As already stated, we do not at present know the exact nature of the septic virus (the term "septic", as used here, is not identical with "putrefactive"). The first attempt to prove that the processes, that are provoked by this "wound virus", are of a parasitic nature, was made by Mayrhofer, who came to the conclusion that the vibriones that are found in the lochia, were the cause. These however are even less likely to act as the carriers of infection than are the bacteria of putrefaction, since they do not even penetrate into the tissues.

It is only the most recent investigations that seem likely to fill the gap that yet remains. Everything combines in pointing to the spherical (as opposed to bacilliform) bacteria as the true carriers of the poison, and to this poison therefore being an organised substance, a *contagium animatum*. These organisms are everywhere present, both in the virulently septic fluids, and in the tissues which are primarily and secondarily involved by the infection; and although their presence *ipso facto* is no proof that they are the cause of the infection and of the consequent illness, yet their constant occurrence is doubtless not without great significance. We may be quite sure that these organisms have at least some important relation to the morbid processes¹.

¹ This view is by no means universally accepted. Quite lately C. Braun v. Fernwald (*Lehrbuch d. gesammten Gynäkologie*, 2nd ed., Vienna, 1881) amongst others has come forward, and declared that the presence of bacteria appears to be of secondary importance, as regards the etiology of traumatic and puerperal fever: it is the putrid poison that kills and produces fever, whether bacteria are present or not. But the arguments quoted by Braun are not such as to cause much difficulty to the supporters of the bacteric theory. His conclusion in particular that micrococci have no relation to puerperal fever, because they are also present in diphtheria and even in the lochial secretion of healthy women, is not a legitimate one, at any rate until our methods of investigation have thrown more light on the morphology of these minute organisms, and therefore have decided the question whether bacteria, which look alike, are really of equal value in their operations (cf. also Koch, *Untersuchungen über d. Aetiologie der*

Again, the puerperal virus is no more specific than we have shown puerperal fever to be. That virus need not be derived from a puerperal woman; it may develop on any unhealthy suppurating surface, and does this with especial readiness in most corpses at a quite early period. Moreover it is very apt, according to universal experience, to form in cases of hospital gangrene, and on erysipelatous surfaces; indeed the erysipelatous poison seems to be intimately allied to the puerperal. On the other hand the puerperal virus appears to have no particular connection with the infectious material of true diphtheria (I shall return to the so-called diphtheritic membranes of the genital canal, when I come to describe the anatomical characters of puerperal fever), nor with the poisons of the acute exanthemata. These diseases may of course break out in lying-in women, and even in those who are attacked by septic diseases. But when they do so, these zymotic disorders and the puerperium, or the puerperal sepsis in the main advance quietly side by side, although no doubt their characters may be more or less modified.

§ 841. The foregoing discussion shows, that we were fully justified in taking the view, which we did at the outset, namely that all puerperal fevers are septic disorders. On the other hand these diseases may be broadly divided into two classes, the first of which merely includes cases of suppuration of puerperal wounds, while to the second belong the disorders which are caused by the absorption of the actual wound virus. The first group embraces the milder affections, to which the term "traumatic" is generally

*Wundinfektions-Krankheiten**, Leipzig, 1878, p. 26). Billroth's view, that the septic poison may be produced without its being possible to find bacteria in the affected regions, is met by Litten (*Zeitschrift f. Klin. Medicin*, vol. ii, 1881, p. 500) with the remark that the impossibility of discovering those micro-organisms anatomically cannot be accepted as proof of their absence, since such absence at the time of the anatomical investigation, does not enable us to draw any retrospective conclusion in regard to processes during life. The presence of micrococci can almost invariably be demonstrated in the kidneys (even when they are absent from other regions), i.e. in the organ which more than others has the duty of eliminating them from the body. The question whether septic diseases are solely due to formed organisms, or whether they can be provoked by a virus in solution must, to say the least, still be regarded as *sub judice*.

* Cf. the English translation of this work by Watson Cheyne (*Investigations into the Etiology of Traumatic Infective Diseases*, published by the New Sydenham Society, 1880), p. 19 et seq. (Tr.)

applied, the latter includes true puerporal septicæmia. Whether such true septicæmia can be produced *solely by the products of the putrefactive germs* is still doubted by many. But it is unquestionably possible (and our bed-side experience proves that such septic disorders usually progress favourably, if only the seat of infection is removed) for the body to be acutely poisoned, in consequence of a prolonged and gradually increased absorption of the chemical products, that are formed by the putrefactive bacteria. It is also possible that such absorption may provoke suppuration in distant organs in very debilitated persons with diseased vessels, which offer no obstruction to the wide-spread diffusion of those germs and their products, as indeed we have already indicated in § 838; it is still more probable that the action of the putrefactive bacteria on the venous thrombi, which are exposed at the placental or occasionally too at some other area, may lead to putrefaction of those thrombi, and that, through the transportation of the decomposed clots, embolic processes (giving rise to typical phlebitic septicæmia) may follow. The transportation of non-infected portions of thrombi does not, as we know, lead to any secondary toxic diseases.

The first group, as well as those cases of septicæmia that lie so to speak between it and the second, and are due to the absorption of products of putrefaction, mainly arise by means of so-called *auto-sepsis*; in other words the medium, in which putrefactive bacteria usually develop, is the body of the woman attacked. It must however not be forgotten that these bacteria sooner or later came from without.

Even in the second group there is great probability that the wound virus frequently develops on the puerperal wound, and in its secretions. Those puerperal diseases especially, whose onset is not very violent, are usually due, not to a direct infection from without, but to infection from within the parturient canal itself, to putrefaction going on in it, which latter must be attributed to the previous entrance of air into the parturient passages during labour. In these cases we are frequently driven to suppose that, under certain conditions of which we are still ignorant, the true "wound germs" (infective germs) develop from simple putrefactive germs, a view which is by no means far fetched, if we bear in mind the recent investigations as regards the

convertibility¹ of innocent into pathogenic germs (Buchner, Grawitz, Pasteur).

In the majority of the puerperal diseases however that belong to the second group, the wound poison has probably been directly introduced *ab externo*. It may either enter directly into the fresh wound, not uncommonly at the same time that that wound was produced (in which case the inoculation is direct), or else pass first of all into the secretions of the genital tract, in which it then finds the necessary nourishment, and continues rapidly to multiply, and from which it poisons the body, by gradually invading its tissues more and more extensively. The first mode usually occurs during delivery, the last during the days that immediately follow it. The former mode (direct inoculation) causes the most intense intoxication, for the reason that the fresh wound furnishes no obstacle, either to the rapid development or to the speedy transmission of the germs. With the latter mode the infection is weaker and progresses more slowly, the better the wounds are covered with exudation and granulations, and the older they are.

The actual conveyance is mainly effected by the hands and clothes of the attendant, by the instruments that are introduced into the parturient canal, and by the apparatus that is employed during, and after, delivery, including the bedding and sheets. But fingers and instruments remain the principal carriers of the virus, since they come into contact with all sorts of decomposed matters, and very frequently cause slight injuries, into which they can then inoculate those materials. We cannot altogether disprove the possibility that air also may carry the wound poison; but if so, it is only that air which immediately surrounds the individual concerned, and it operates not through the respiratory organs (for the virus is no more able to penetrate the

¹ Quite recently Kocher (*Sammlung Klinisch. Vorträge*, 203—204, p. 1722) has revived a theory which had previously been promulgated, viz. that the microbes (endogenous organisms), which normally occur in the healthy organism, and which are usually rendered innocuous by the oxygen-containing blood, may undergo vigorous development under the favourable influence of a dying tissue with suitable temperature and adequate moisture, and cause decomposition and putrefaction of the necrotic tissues. Inasmuch as these conditions are very frequently present on the inner surface of the genital tract during the puerperium, we should not be justified in denying off hand the possibility of septic disease arising through the proliferation of endogenous organisms in the sloughing uterine and vaginal mucosa, were it not that the presence of micro-organisms in the healthy tissues of the body is, to say the least, questionable.

intact mucous membrane than it can the external skin), but by the access of air and of the poisonous germs contained in it, to the injured genital organs. But even in the cases, in which one might suspect such a mode of transportation, there are so many other possible means of transmission, both in regard to persons and utensils, that the view that the air is the carrier always seems somewhat far fetched; especially when we remember that in the so-called "ward epidemics" the attacks usually advance from bed to bed.

§ 842. Thus a study of the nature and origin of puerperal fever contradicts any theory of specificity, and shows clearly that processes, which appear at first sight to be very different and which run a different course, are yet fundamentally identical and have a similar genesis. All peculiarities can be explained by the anatomical relations of the genitals during the puerperium (the abundance of dilated lymph and blood channels, the adjacent loose layers of connective tissue, and the vicinity of the peritoneum), by the situation of the wound, the date of the infection, and the idiosyncrasy of the affected individual. All the other factors, which are regarded as ætiological, have only a secondary importance, and, in so far as they favour or impede infection, are embraced in the ætiology explained above.

In the first place ranks *protraction of labour*. It is an old experience that, after labour has lasted beyond a certain time, the risk of subsequent disease gradually increases. And this is just what we should expect, for the longer the duration, the greater as a rule is the accompanying injury, the more frequent are the examinations, and the more numerous the opportunities for infection.

Primiparæ fall ill more often than do *multiparæ*, and various investigations (Duncan, Hugenberger) show that more of them, comparatively speaking, die in childbed. Assuming that these facts are not invalidated by their being mainly based on the statistics of lying-in hospitals (in which the number of *primiparæ* usually predominates over *multiparæ*), this unenviable distinction of a first labour can only be explained by its longer average duration and by the just-mentioned sequelæ of such protraction. The same reason explains the greater morbidity of *elderly* *primiparæ*, as compared with young ones, and the slight predominance of illness after the *accouchement* of *boys* over that of *girls*.

Some authors have asserted that these diseases are common after the birth of *decomposed foetuses*, as a result of direct infection. My observations, like those of many other obstetricians, do not confirm this, as far at least as the question is limited to macerated foetuses, and does not include such as decompose *in utero* during delivery, after the rupture of the membranes. On the contrary, in our experience here, women, who have been delivered of macerated foetuses, are, generally speaking, amongst those that recover most rapidly¹, and strange to say this applies especially to those in whom syphilis was the cause of the intra-uterine death. Probably this depends on the average facility and rapidity of such deliveries, on the fact that there are usually much fewer examinations and less interference, and on the early closure of the veins. Of course there are no *a priori* grounds for expecting a simply macerated foetus to lead to infection; it does not contain any septic matters (*vide* § 397).

Jan. Feb. Mch. Ap. May June July Aug. Sep. Oct. Nov. Dec.

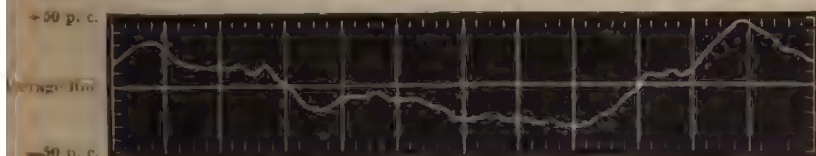


Fig. 121.—Curve showing the prevalence of puerperal fever in London at the different seasons of the year, constructed by Matthews Duncan.

The variations in the frequency of puerperal fever, which are associated with the *seasons of the year* (fig. 121), the more frequent occurrence, comparatively speaking, of attacks during winter (and it has been shown by more than one observer, *e.g.* Duncan, Boehr, Lusk, that the variation applies to private practice also), have frequently been insisted upon, as disproving the view that puerperal fever is exclusively an infective disease. The explanation is not improbably mainly to be found in the unwillingness of the attendants to use frequent ablutions during

¹ Out of 95 women who gave birth to macerated foetuses in the Maternity here, only one died of puerperal fever, and she had been subjected to version and extraction, on account of placenta previa centralis. Very similar are the results obtained in Vienna by Braun, Chiari, and Spath (*cf. Klinik der Geburtshilfe*, 1863, p. 463, p. 21). A yet larger collection of such cases has been published by Mewis in his *Dissertation*, "Ueber puerperale Erkrankungen in der Strassburger Entbindungsanstalt," Strassburg, 1874, pp. 27—34.

the cold season of the year. As regards lying-in hospitals, the fact may be attributed to their being most frequented during the cold season of the year, to the more frequent clinical instruction which is given during winter, and to the greater difficulty of strictly attending to hygienic precautions during the late autumn and during winter. We know moreover that persons, who have got wet or chilled, and have contracted illness in consequence, suffer more than others from wounds and traumatic diseases.

But the best proof of the infective, i.e. septic, nature of puerperal fever (apart from the fact that women, who are confined without any obstetrical examination having been made, are scarcely ever attacked, and that conversely the morbidity and mortality increase with the frequency and severity of such examinations) is furnished by *lying-in hospitals*, which, it used to be supposed, clearly proved the miasmatic origin. For it is a matter capable of demonstration, that, where the transference of septic matters is systematically prevented, the worst constructed hospitals may be the most healthy, while, when such precautions are omitted, a hospital, however well constructed, may be most unwholesome. It matters not whether this or that quantity of cubic space is allowed *per patient*, whether this or that form of ventilation is in vogue; the one material question is whether sufficient antiseptic measures, and whether such clean hands are used, as to maintain a continuous prophylaxis, and to shield those women who are still in good health. If these points are attended to, a lying-in hospital, as far at any rate as the morbidity and mortality are not controlled by the kind of labours (long protracted cases, or such as involve difficult operations, or parturient women who have already been infected) which are taken to it, will doubtless yield quite as favourable a (possibly a better) bill of health as does private midwifery. Indeed the results of the latter are by no means as brilliant as is usually stated, and Winckel has done a good service, which is well worthy of imitation, in calling attention to this; he has lately proved the same fact in respect of a greater district (*Berichte und Studien*, ii., 1876, p. 242, and iii., 1879, p. 431)¹.

¹ These statements hold good in regard to other countries also, as is shown by the valuable reports of Boehr (*Zeitschrift f. Geburtshilfe und Gynäkologie*, vol. iii., 1878) and the *Denkschrift* of the Berlin Committee on Puerperal Fever (*ibid.*). The terrible fact is there disclosed, that in Prussia in the course of two generations more women have died during the sexually mature period of life from puerperal fever than females

§ 843. There is just one other point that must be touched upon, since it might be raised as an objection to the doctrine of the exclusively septic nature of puerperal fever; I mean the rarity of this disease in *pregnant women*. The instances, in which attacks of puerperal fever have been observed before the commencement of labour, are on the whole very rare; I only remember having seen one well marked case, and there, after an examination in the *clinique*, erysipelas of the external generative organs showed itself, and was followed by a very lamentable termination. The signs of contagion, which are sometimes seen in new-born children immediately after delivery, must only be regarded as indicating a conveyance of such contagion from the gravid mother or her blood, when it can be shown that the foetus has not absorbed the infecting substance during delivery, or that the changes, which its body presents, are already too old to have such an origin. Perhaps on the other hand infection is commoner in the gravid state than would appear at first sight; perhaps it is generally regarded as only having originated during labour, because the infection and its effects are soon followed by parturient activity. However this may be, it is at any rate rare, considering the number of pregnant women who are examined in connection with schools of medicine, considering the want of delicacy and cleanliness with which those examinations are usually carried out, and how frequently the portio vaginalis presents a loss of epithelium in these hospital patients. We must therefore suppose that the mechanical conditions of the genital apparatus before parturition are as unfavourable to the absorption and propagation of the poison, as they are favourable during, and soon after, delivery. No great stress can be laid on the fact that the cavity of the uterus is still closed during pregnancy, and that there is no nutritive fluid (like the lochia) for the introduced germs, for the reason that infection usually occurs at the cervix.

Before concluding these ætiological observations, I must warn the student against regarding every case of phlegmon in the pelvis and abdominal cavity of a lying-in woman, as puerperal

of all ages have from small-pox and cholera together. Even in the year 1875, amongst the 60,399 women who died during the age of sexual activity, 7,213=12.41 p. c. died in childbed. The statements by Ingerslev, as regards the mortality from puerperal fever in Denmark, are very similar (*Centralblatt f. Gynækologie*, 1880, No. 15).

in the narrow sense of the word, *i.e. as caused by infection*. It is not altogether rare for peritonitic and especially retro-peritonitic inflammation to be caused by intestinal ulcers, both in the cæcum and in the descending colon, the symptoms of which were obscure or but little attended to, or perhaps falsely interpreted during pregnancy, but which show their well known effects during the post-partum state, especially under the influence of faecal accumulation, of some injudicious drugging, or of a mistaken use of purgatives. That inflammation, due to such a cause, may creep upwards¹, and present an exact picture of a progressive septic phlegmon, I have satisfied myself more than once, both during life and at autopsies. The very slow progress of such a case is the only way of distinguishing it from one of septic phlegmon.

b. Anatomical Seat, Post-mortem Appearances and Varieties of Puerperal Fever.

§ 844. Febrile puerperal diseases have above been divided into two groups, in one of which there is merely supuration of the puerperal wounds, while the other includes true septic processes. I pointed out moreover that in the case of the latter, septicæmia would assume the lymphatic or phlebitic form, according as the poison took one or other path during its diffusion through the body, and also that either form might prove fatal so rapidly, as to leave no time for any cellular new formations (acute septicæmia without special localisations). Both the lymphatic and the phlebitic forms are characterised by more or less definite anatomical changes. These however vary extremely. Some belong to both forms, and in any individual case they may combine in such a variety of ways that, in the organs attacked by the parasitic processes, sometimes one form, sometimes another predominates. Hence we get a very confused picture both from anatomical and clinical points of view, and it is very difficult to classify the different conditions that are met with. Our most convenient course will be to deal with the disorders, that occur in the different regions, one by one, and to consider them in the order in which they spread. We shall therefore start from the point at which the poison is first

¹ Cf. also Sanger, "Three cases of pleuro-perforating peritonitis, with remarks on subperitonitis and perforation of the pleura" (*Archiv d. Heilkunde*, vol. xix.)

deed occasionally a circumscribed, or possibly even a general, peritonitis may follow, either owing to contiguity, or to the actual escape of the purulent contents of the Fallopian tube. But as a general rule the inflammatory products, which are found at the abdominal extremity of the tubes, are due to another cause, *i.e.* are secondary to the inflammation of the subserous connective tissue.

It is not very uncommon for inflammation and suppuration to involve the connective tissue that surrounds the cervix, which tissue, as already mentioned, so often participates in the injury, and in which pus is especially liable to form (*parametritis, phlegmon pelvis traumatica*). The affected tissue then grows puffy, swollen and boggy; indeed, although the usually favourable issue of the disorder only rarely gives us an opportunity of seeing such anatomical conditions, we have every reason for supposing that these cases are due to the same kind of inflammatory infiltration, as accompanies simple phlegmon on the surface of the body. Hence we frequently get absorption of the infiltration, or thickening and condensation of the affected tissue. An abscess is only likely to follow, where there is an abundant, localised formation of pus. If this condition leads on to general phlegmon of the body, there must always be a fresh infection, or some sloughing processes accompanied by constitutional disturbance.

§ 846. *The inner surface of the genital canal need not present any very striking morbid appearances, even when the infective processes are well developed. Indeed there may be no distinct macroscopic changes whatever, even when the poison has spread rapidly through the body, and has caused speedy death, i.e. in the severest cases.*

The most frequent changes however are ulceration and the presence of false membranes on the vaginal and cervical wounds. In the case of the latter the mischief sometimes reaches deeply into the connective tissue of the muscle. The inner surface of the uterus may in rare cases entirely escape, as already stated;

¹ This mode of origin of peritonitis has been especially advocated by Buhl (Hecker und Buhl, *Klinik der Geburtshülfe*, i., p. 223), Martin (*Monatsschrift f. Geburtskunde* xiii. and xvii.), and Förster (*Wiener Medicinische Wochenschrift*, 1859); and quite recently again by Traube (*Berliner Klin. Wochenschrift*, 1874, No. 6, Wenzel's) (*Pathologie u. Therapie d. Wochenb.*, 1878, 3rd ed.), and von Höcker (*Centralblatt f. Gyn.*, 1878, No. 8).

but as a rule its parietal mucous membrane is detached or abraded over a more or less extensive area, and can be stripped off as a greasy mass. Sometimes that membrane looks almost dry in places, and is covered by the so-called croupous or diphtheritic deposit (*endometritis diphtheritica*). Beneath this, which is most frequently met with at, and round about, the placental site as well as at, and below, the internal os, the muscularis appears quite smooth; it has then been exposed by disintegration of the mucosa, and these spots look as if they had been eroded, when compared with those where the mucosa is still attached. Some observers, especially Martin (*cf. Berliner Klinische Wochenschrift*, 1871, No. 32), have regarded this diphtheritic process as the principal, *i.e.* the essential, element of puerperal fever, have identified it with true diphtheria, and supposed the general infection to be secondary to its local action. This however is a mistake. The layer in question, as already mentioned, merely corresponds to a so-called pyogenic membrane, which is formed by the inspissation of inflammatory products on the surface of ulcerating areas. This is shown by the ease with which the membrane can be stripped off, by the absence of any such tendency of the subjacent layers to break down, as characterises true (*e.g.* pharyngeal) diphtheria; further, by the fact that those formations occur in the later stages of the puerperal processes, while they are usually not present in the most acute forms. In the latter it is much more common to find the mucous layer either entirely absent, or absent over large areas, where it has been destroyed by schizomycetes, the muscular wall being exposed and quite smooth (such a condition again has not uncommonly, as Klebs points out, led to the view that no alteration whatever has occurred on the inner uterine surface). In other cases the uterine wall, including the placental area, is covered by irregular ichorous masses, the cavity being filled with an inflammatory pulp. This is especially observed, where there is simple putrefactive disintegration of the mucosa, and where large remnants of the decidua and placenta are retained. But this putrefaction process may also extend to the muscularis itself, and destroy it over certain areas, of which the edges will be found eroded and discoloured (*putrescentia uteri, endometritis necrotica*).

§ 847. Where these processes are going on, the *uterine paren-*

chyma is always flabby and infiltrated with serum; the vessels are empty or incompletely filled, only a few of the larger veins containing clots. Moreover on close examination some inflammatory changes in the intermuscular connective tissue will almost always be found. Here and there some portions of it will look swollen, or present a gelatinous, turbid infiltration, which, when firm and rich in cells, resembles the so-called lardaceous infiltration; when of longer duration, it assumes the character of pus, and may lead to small abscesses. This seropurulent infiltration of the connective tissue is especially constant beneath the serosa, where this lines the postero-lateral portions of the body of the uterus, and at the lower broad portion of the area of attachment of the ligamenta lata. In the first-named situation the lymphatic vessels, which under normal conditions are invisible to the naked eye, become greatly widened, so much so as to attain the size of a quill. Further they present local enlargements, which may be arranged irregularly or in rows, and reach the size of cherries, and which are filled with a puriform material, with pus-corpuscles and micrococci (fig. 122). Occasionally such local ectases are also found along the margin of the fundus, and even in the substance of the uterus, where they may look like small abscesses (*metrolymphangitis*). The phlegmonous infiltration is most severe at the point where the broad ligaments leave the uterus, i.e. in the true parametric tissue (*cf. supra*, § 48), and is especially distinct round the vessels of the venous plexuses. The lymphatics also of this region present the same characters; and indeed from this point it is possible to follow the advance of the morbid processes continuously from the ulcerating portions of the internal os and cervix. Nor is it difficult to see the connection between the septic changes in the subserosa and lymphatic vessels, and the alteration on the inner surface and in the parenchyma of the uterus, when we remember the continuity and the similarity of the tissues involved, and the fact that the mucous membrane is merely a very extensive lymphatic sinus (*cf. § 64*). It is also easy to see why the serous lining of the uterus, which of course belongs to the lymphatic system, is always injected, opaque and covered, at any rate at certain points, with a coagulated or semi-coagulated exudation.

The placental area is most frequently not at all, or but little, affected by the various changes that have been described. Its

thrombi are usually tough and firm, and look quite healthy, when the greyish deposit, which is still adherent, has been stripped off. This may be due to the fact that the thrombi rapidly become consolidated by the cell proliferation, which starts from the wall of the vessels, and that the thrombosis may have begun in the deeper layers, and be in part completed before delivery (*cf.* Friedländer, *Anatomische u. Physiol. Untersuchungen*, 1870). Only where the septic infection is very intense, and particularly where it occurred during, or before, the commencement of labour, will the thrombi remain soft and permit the entrance of the poison into the blood channels; while conversely thrombi that have become firm, may even later break down, where there

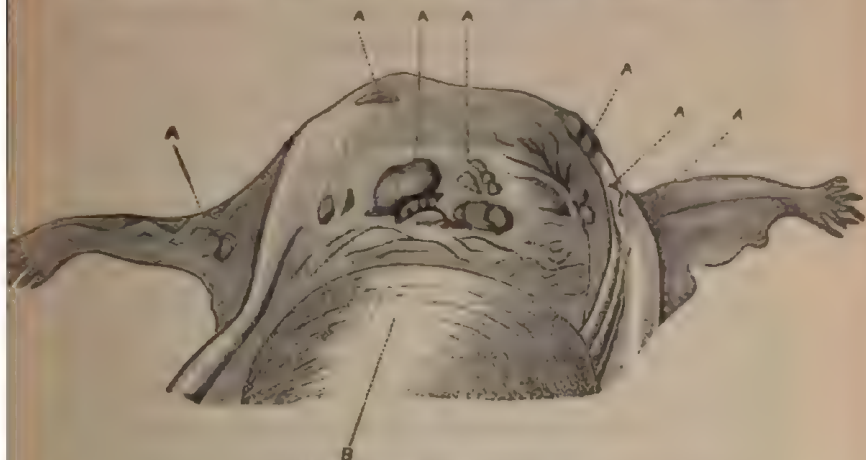


Fig. 122.—Anterior aspect of the uterus.
A. Dilated lymphatic vessels filled with puriform matter. B. Bladder.

is extensive suppuration within the uterine cavity. Under such circumstances phlebitic or periphlebitic abscesses sometimes form in the uterine tissues, and they may be followed up towards the large veins of the pelvis (*metrophlebitis*).

§ 848. It is easy to see that, owing to its anatomical arrangement, the pelvic connective tissue is almost sure to be affected, when the uterine parenchyma is so. Indeed parametritis is, after peritonitis, the commonest pathological condition, owing to the fact that it accompanies both the septic processes on the inner surfaces of the uterus, and those that start in the cervix and vagina; anatomically speaking, it bears the brunt of the attack

in puerperal sepsis, while as regards injuriousness also it ranks first. This septic parametritis is entirely analogous to phlegmonous erysipelas on the surface of the body, and is characterised by the presence at an early period of a sero-purulent oedema, and subsequently by purulent destruction of the tissues, accompanied by distention of the lymphatics with pus- and micrococci-containing masses, (*parametritis phlegmonosa, lymphatica*). Virchow (*Archiv*, vol. xxiii.) has described this condition in a classical manner, and given it the very appropriate name of *erysipelas malignum para-uterinum*. The tissues are swollen, infiltrated with discoloured serum, and studded with yellowish, sometimes discrete, sometimes diffuse, sometimes firm, sometimes soft, deposits, which, when the process has lasted for some days, may even macroscopically appear as suppurating foci. The lymphatic vessels are, as already mentioned, always involved, but less distinctly so in the parenchyma of the broad ligaments than in the true parametric tissue and at the hilum of the ovary, since they do not present the same nodular dilatations in the loose structures of the broad ligaments, such as are produced in the last-named and firmer regions, as a result of the swelling of the tissues and of the stagnation. When the morbid process extends further upwards into the retro-peritoneal connective tissue, the cords formed by the vessels, which may have a beaded appearance, will be found in that tissue also. Those vessels are the usual means by which the phlegmon extends suddenly, while more gradual extension follows the bundles and lamellæ of connective tissue.

The whole of the connective tissue however is not always attacked, as above described. One side may be quite free, and even in the involved area deeply affected portions alternate with healthy ones. The milder the septic infection, the more the micrococci perish through purulent destruction of the diseased tissues, the more likely is the process to be confined to the pelvis, and the more uniformly will it be distributed there. In such cases indeed it seems as if the lymphatic glands had acted as a barrier. Conversely, in severe and rapidly fatal attacks, the disease extends by fits and starts, and is widely distributed. In the pelvis the disease is most apt to spread downwards and outwards; where progress is slow, pelvic abscesses form and open on the surface in directions which, anatomically speaking, are determined by

the fasciæ and notches, and are familiar to surgeons and pathologists. They usually advance towards the iliac fossa, towards the inguinal furrow, and from here beneath the anterior abdominal wall, and into the retro-peritoneal cellular tissue, or else upwards round the psoas, to the capsule of the kidney and to the diaphragm. Occasionally also they pass downwards with the great vessels towards the inner side of the thigh, where they may sometimes lead to extensive disorganisation.

§ 849. The ovaries are not uncommonly involved in cases of septic parametritis, the left one more often than the right; when both suffer, they are unequally affected. Indeed this *oophoritis* may be the principal morbid change in the pelvis, apart from the parametritis. The commonest variety is the *lymphangitic*, in which case the same purulent foci will be found in the hilum of the ovary as under the uterine serosa, also the same dilated lymphatic vessels, filled with micrococci-containing material, which vessels penetrate far into the medullary substance; sometimes too there are phlebitic abscesses and follicles filled with pus. *Septic oophoritis*, in the narrower sense of the expression, is a rarer form. The ovary is then found markedly swollen and enlarged, reddish-grey in colour, covered with hæmorrhagic spots, and permeated by a turbid fluid, rich in blood and cells; moreover its consistence is soft and pulpy, sometimes so soft that the tissues break down, when touched (putrescence of the ovary). In both forms the tissues between the uterus and ovary may be apparently unaltered.

§ 850. The *peritoneum* is almost invariably involved in puerperal fever, whether the morbid process has started from the inner surface of the uterus or from the cervix (sc. paracervical tissue). This peritonitis of course varies in intensity, according to the acuteness of the infection, but it is so common, and takes so prominent a place amongst the symptoms of puerperal fever that it has at times been thought to constitute the whole disease. I have only seen the peritoneum escape in a few instances of purely phlebitic septicæmia, where this was caused by decomposition and destruction of the placental thrombi, following upon decomposition of retained intra-uterine masses. Moreover the almost invariable participation of the peritoneum is easily explicable by its proximity to the sexual apparatus, and especially by its essential similarity to a great lymph sac,

or to a lymphatic gland which has been spread out over a large area.

In mild attacks, the inflammation is limited to the pelvic portion of the serosa (*pelvic peritonitis*), and may then be regarded as connected with the metritis and parametritis. At such times fluid pus or a pseudo-membranous coagulated exudation, accompanied by marked subjacent hyperemia and even by fine villous outgrowths, is found in all the folds and pouches of the peritoneum round the uterus, or else only in Douglas' space, in the broad ligament, or in the neighbourhood of the ovary. According to the intensity of the infection, the exudation or pus will be found inspissated or laudable, or thin and serous. In the first case the various pelvic organs and the folds of serosa become agglutinated and adherent, and this is followed by the formation of more or less localised suppurating centres and intra-peritoneal exudations, which in time become shut off, and all of which afterwards lead to adhesions and bands.

Where the septic infection is more severe, *general peritonitis* always follows, although of course the pelvic peritoneum suffers most. This well marked septic peritonitis (*peritonitis lymphatica*) arises through the septic germs (micrococci) wandering into the peritoneal cavity by means of the lymphatics. Consequently at first no signs of inflammation are present. The serosa is dull, and covered with a turbid, greenish-grey, offensive fluid, which consists of a thin transudation and of the above-named morphological elements. The intestines are flaccid and œdematous, and in a condition of paralysis caused by the action of the bacteria on the muscularis; meteorismus is therefore present from the first. The serous surface is here and there injected in streaks, sometimes discoloured by blood; at other places it is empty, owing to the pressure of the loops and organs against each other. The real signs of inflammation set in later, and may therefore be entirely missing, where the issue proves rapidly fatal. They may be recognised by a fibrinous exudation, which glues the organs one to another, and at a later period by a proliferation of new cells and by the presence of pus.

This diffuse peritonitis is in the majority of cases accompanied by *pleurisy* and *pericarditis*, the inflammation in such cases having spread by means of the lymphatics of the diaphragm, these being filled with similar materials to those contained in

the abdominal cavity (Recklinghausen, Waldeyer in *Archiv f. Gynaekologie*, iii., 1872, p. 293). The effusions into the synovial cavities of the joints also arise in the same way, and may form quite suddenly.

§ 851. The veins may be variously affected in septic disorders.

Simple thrombosis in the uterine and pelvic veins, spreading from there to other parts, is, as we know, not rare during the puerperium. It is merely followed by disturbance of the local circulation, at most by simple embolism in distant organs, and in this aspect has already been referred to in §§ 806 *et seq.* But any bacteria, that happen to be in the neighbourhood, especially those circulating in the blood, are very apt to settle in these thrombi, which then soften under the influence of the septic poison.

In other cases *phlebitis* arises in the uterine and para-uterine, purulo-phlegmonous foci, by the morbid processes extending to the walls of the veins, this being then followed by secondary thrombosis. These *phlebotic thrombi* do not necessarily break down, and when they do not, they may delay the extension of the septic mycosis into the lumen of the blood channel. But as a rule they soften under the influence of the inflammation and of the schizomycetes, and are transformed into the familiar puriform masses.

A third mode of intoxication by means of veins occurs in cases where the *veins of the placental area* are destroyed under the influence of the putrefaction and sloughing, which are taking place *in utero* (cf. § 847).

Now, as a rule, fresh thrombi form on the side of the blood stream, behind the thrombus which has broken down. Nevertheless that thrombus is only shut off in quite exceptional cases, each newly thrombosed mass being, as a rule, in its turn infected and softened. The action of these masses is extremely deleterious, since minute portions of them, together with bacteria, pass into the free blood channel, and produce general septic toxemia. Frequently this causes speedy death; but if not, these masses give rise to a large number of the well known metastatic inflammations and abscesses in the most various and distant organs (pyæmia), a condition in which toxic embolism plays a most important, although not a constant, part.

§ 852. The affections of the genital apparatus that have just been described, give rise, sometimes rapidly, sometimes slowly, to secondary disorders in distant organs and in part also to the constitutional symptoms of the disease. Occasionally however, the intoxication may, as has already been stated, be so intense, that there is no time either for local irritation and inflammation, or even for marked changes in the generative organs, to show themselves. The poison has then by means of the lymphatic vessels or veins been very rapidly, copiously and actively disseminated through the blood, and the mycosis has led to decomposition of that fluid (*acute sepsis*; also appropriately called *acute decomposition of the blood*). Under such circumstances the necropsy will merely reveal rapidly advancing decomposition, a thick state of the blood, enlargement of the spleen, swelling and opacity of the cardiac muscle and of the parenchyma of the great glandular organs (due to commencing decomposition and to innumerable bacteria), such as the liver, spleen and kidneys. If the poison has been absorbed through the lymphatics, masses of bacteria will generally be found in the pelvic portion of the peritoneal sac. If on the other hand the absorption has taken place through veins, ichorous, broken down chocolate-brown thrombi will be present.

§ 853. The *secondary* disorders may be divided into two groups, of which one embraces a series of conditions which are more or less diffuse in character, viz. the parenchymatous changes and the progressive phlegmon, while the other is characterised by the presence of circumscribed metastatic foci. The first group mainly accompanies the lymphatic variety, the second the venous. It is rare for either variety to occur wholly independently of the other; the lymphatic does so most often, the venous, where present, usually being superadded to the lymphatic. But even the venous may now and again be observed in an unmixed form, and, as I have already mentioned (§ 802), especially when it arises from a decomposition of placental thrombi, caused by decomposed remnants of the ovum.

The lymphatic variety was but little understood by earlier observers. Nevertheless they noticed the enlargement of the spleen, and from it deduced a suggestive analogy with typhus (Cruveilhier's puerperal typhus). Indeed that name would not be such a bad one, were it not that wrong conceptions of the

nature of the illness are so frequently connected with it. This form of septicæmia is the one to which Virchow has given the name of *ichorrhæmia*, "ichor" being formerly applied to all decomposed, thin fluids derived from inflamed centres. But we know now that it is the schizomycetes that carry the septic matters.

There can be no doubt that as a rule the metastases depend on the immigration of infective emboli, and the appearances met with, where the poison is absorbed through the veins, are therefore mainly the same as those accompanying pyæmia, in the narrower sense of the word. Since moreover the majority of emboli are derived from broken down, venous thrombi, the embolic foci and abscesses are, as would be expected, commonest in the lungs, the reason being that the emboli are rarely able to traverse the pulmonary capillaries, so as to reach the organs supplied by the left side of the heart. The local and lobular inflammations, which are present in those organs, can sometimes be attributed to embolism resulting from undermined and destroyed pieces of endocardium. But there are plenty of cases left, where neither an embolus nor its possible source can be detected, so that we cannot wholly disprove the possibility of circumscribed purulent inflammation being sometimes produced by lymphatic sepsis. Doubtless the schizomycetes get into the blood stream, and thence into every possible organ, although it is hard to say why they there sometimes cause, not diffuse, but merely localised, changes. But further it is possible that the local foci are due to phlegmon of the connective tissues, to phlegmon having spread to those tissues in the interstices of the several organs.

The reason therefore why we only rarely meet with instances of purely lymphatic or of purely venous sepsis, is that the sequence of the secondary processes and phenomena is very variable, owing to the varying rate at which the germs, which cause the progressive infection, attain their development. Consequently the morbid appearances too, to which the septic infection gives rise, will usually, as has more than once been pointed out, vary greatly. The same explanation holds good for the differences found in individual cases.

§ 854. It will be sufficient, if I briefly indicate the morbid changes in the various organs.

The organs that adjoin the genital tract, *i.e.* the bladder and rectum, not infrequently exhibit similar morbid processes to those on the inner surface of that tract. Thus there may be sloughing cystitis and proctitis, originating *per contiguum*, and usually associated with slight abrasions of the mucous membrane, due to the use of the catheter or to clysters, in which abrasions schizomycetes have settled. The walls of the intestines are frequently infiltrated with serum, the mucous membrane is injected, and the follicles are swollen. On two occasions I have seen the mucosa of both small and large intestine as it were studded with small sloughing centres, due to capillary emboli; in one there was ulcerative endocarditis, in the other putrefaction of the uterine thrombi.

In the liver the condition met with varies usually from a mere parenchymatous cloudiness and disintegration of the cells to acute atrophy, these conditions being either generally and equally distributed throughout the organ, or else limited to certain areas, and more distinct in one than in another. Abcesses and embolic foci are rare.

The spleen is almost always considerably enlarged and swollen. Its capsule therefore is tense, the pulp soft and diffuent. Embolic infarcts are commoner than in the liver; so too are localised infiltrations of a mycotic nature.

Septic nephritis is not uncommon. At any rate there is almost always the well known cloudy swelling, the fatty infiltration and the disintegration of the epithelium of the urinary tubules. Embolic clots are especially fond of settling in the kidneys. Sometimes too thrombosis is found to have extended all the way from the pelvis, or else with occasional interruptions. Purulent nephritis may also be present.

Pleurisy is usually an extension of the peritonitis, in other words is a symptom of the lymphatic infection, or else it follows on inflammation of the diaphragm. More rarely it results from pneumonic, and then generally from embolic, infarcts. Where the exudation is on the left side, some pericardial effusion frequently co-exists. It has already been mentioned that the lungs are the most frequent seat of the actual metastatic embolic alterations. But lobar pneumonia and diffuse inflammation also occur, whose origin is to be attributed to schizomycetes which have immigrated by means of the blood, or to the

Extension of progressive phlegmon through the peritoneum to the peri-bronchial connective tissue (interlobular pneumonia of Buhl). Occasionally too gangrene of the lungs is caused by large septic thrombi obstructing the circulation.

The *cardiac muscle* almost always shows signs of degeneration, and sometimes contains small emboli. *Ulcerative endocarditis* however, usually valvular, is the condition which deserves special attention. This affection has been comparatively often seen in some epidemics, although on the whole it is not common¹. The published investigations on the subject leave no doubt that it is produced by circulating mycetes, which have settled in the heart². Such cases however are usually relapses, i.e. a fresh attack is provoked on portions of the valves that are already sclerosed. Old endocarditis would appear to be a very predisposing condition to the settlement of the germs, and this fact may explain why the affection is not so common as might be anticipated, from the frequency with which micrococci pass into the blood. At any rate this ulcerative endocarditis is a very important factor in toxic embolic processes³.

Inflammation, suppuration and ichorous destruction of the *parotid*, of the *thyroid* and of the *mamma* are rare, and, when present, generally result from lymphatic septicæmia.

The same is true of *purulent meningitis*. Localised *encephalitic foci*, due to embolism, are certainly uncommon, and, when they

¹ Cf. especially the article by Virchow (*Beiträge z. Geburtshülfe und Gynäkologie*, vol. i., Berlin, 1872), and Olshausen (*l. c.*).

² Klebs believes that the deposition of micrococci along the exact line of closure of the cardiac valves indicates that the violent collision of these portions of the valves squeezes and renders adherent minute particles that are deposited upon them, perhaps even presses those particles into the substance of the endothelium. Koester, on the other hand, takes the view that the micrococci actually pass in the form of emboli into the arteries of the valves of the heart, and that there in malignant cases they cause alonging of the tissues, leading to loss of substance, while in mild ones they merely produce local elonging, followed by a reactive proliferation of round cells and by the formation of granulation tissue. If the arteries are entirely filled with micrococci, the latter pass out through stomata on to the free surfaces of the valves. Klebs again regards the repletion of the vessels by micrococci as a secondary change, consequent upon their deposition on the surface.

³ Apart from this malignant form of endocarditis, we also find in the puerperium a less serious (rheumatic) variety, which is also said to be of mycotic origin. It too may lead to destruction of the substance of the valves and to emboli, but the latter are of a less noxious character. At any rate the micro-organisms concerned in this form must differ from those associated with malignant endocarditis.

occur, generally accompany endocarditis. Inflammation of the *eye* on the other hand, although also rare, is probably always embolic in nature. It almost always takes the form of panophthalmitis, and ends in destruction of the eyeball. I have seen three such cases, in one of which both eyes were affected. In another case there was merely capillary embolism of the retina (amaurosis shortly before death), in yet another merely purulent choroiditis¹.

Amongst the peripheral disorders, those of the *joints* come first, purulent effusions into the synovial cavities and into the *sheaths of the tendons* deserving special notice. They may occur in both forms of septicæmia, but are commonest in the lymphatic. The shoulder-, wrist-, elbow- and sternoclavicular joints are most often affected; the lower limbs are so much more rarely, but the knee-joint is most liable. In rare cases the pelvic articulations also suffer.

Erysipelas is moderately common, and almost always starts in the generative organs, very rarely in other regions (e.g. the face).

*Erythemas of the skin*², and *subcutaneous and deep-seated phlegmon* are not rare. Only exceptionally do they start from the diseased joints; usually they appear to be independent of them. The case may remain one of acute phlegmonous œdema,

¹ Out of the 13 cases of embolic panophthalmitis, that have been published by Hensch, 12 died (*Archiv f. Ophthalmologie*, xxvi., p. 177, 1880). According to Litten (*Charité-Annalen*, iii., Berlin, 1878, p. 137), retinal hæmorrhages occur in septic fevers without any endocarditis, sometimes as the only alteration in the eye, sometimes as a result of severe purulent ophthalmia. He regards them as of embolic nature, and believes their presence to be of great diagnostic value in doubtful cases (*Zeitschrift f. Klin. Medizin*, vol. ii., Berlin, 1881, p. 414).

² Such septic erythemas must not be confused with the exanthem of scarlet fever. As already mentioned in § 840, the acute exanthemata may break out in puerperal women. Nevertheless the occurrence of scarlet fever in childbed, at any rate here in Germany, appears to be very rare. In Breslau for instance, where a moderately severe epidemic of scarlet fever is still raging, and has been so for some time, no case of scarlet fever during the post-partum state has been observed, either in the in- or out-patient department of the Maternity. Whether the progress of the lying-in state is modified by scarlet fever or not, is still doubtful. Olshausen (l. c.) says no, while others (Liebmann, A. Martin, Schroder, &c.) believe that scarlet fever may give rise to puerperal endometritis, and this to general infection. Consequently the prognosis of scarlet fever during the lying-in state is said to be less favourable than apart from it. Here in Germany scarcely any one still believes in a specific puerperal scarlet fever, a scarlatina or purpura puerperalis (i.e. a disease which appears to be true scarlet fever in its characters, but which is identical with, or closely allied to, puerperal fever). But in England this view has still numerous adherents (cf. *London Obstet. Transactions*, vols. xii. and xvii.).

or may lead on to deep inter- and intra-muscular destruction. The most extensive mischief starts from toxic thrombosis of the larger venous trunks and from periphlebitis. A purely embolic origin is extremely rare¹.

c. Symptoms and Progress.

§ 855. Since puerperal fever is a septic disease, which has nothing whatever specific about it, I may content myself with an even shorter description of its clinical symptoms than I did of the anatomical characters. I need only draw attention to the principal characteristic points, since I should otherwise have to repeat what every obstetrician ought to be familiar with, from his studies in special pathology and surgery.

The phenomena of puerperal fever are made up of the general symptoms, which depend on infection, and of the local symptoms, caused by the local processes.

As has already been pointed out, puerperal fever may *begin* before, or during, parturition, its onset during the latter being more frequent, the longer the labour lasts. But as a rule it starts during the first three days after delivery, most often after 24 to 48 hours; in other words the period of incubation has this duration in the majority of cases. An attack is rare after the 5th day, and I have never seen it after the first week. The apparent exceptions to this statement, *i.e.* the cases in which lying-in women have appeared healthy during the first 8 days or more, and have only later (not uncommonly after they have ceased receiving medical care, or have left the hospital) applied for treatment on account of distinct local disease, are to be explained by the early, often very slight, symptoms having been overlooked. Such are almost always cases of traumatic parametritis, secondary to the suppuration of some wound, in which the initial fever and the local pain were very slight. Under these circumstances the initial fever usually only remains high for one or two days, and then entirely disappears for several days, or else there are only slight morning and evening exacerbations, which escape

¹ In addition to these conditions, parenchymatous inflammation of the muscle has been observed, leading occasionally to a complete destruction of the bundles of fibres (loss of transverse striation, repletion with minute granules of fat). (Cf. especially Winckel's case of polymyositis parenchymatosa, *Centralblatt f. Gynäkologie*, 1878, No. 7).

observation, if the patient is not seen just at the time. There may be no local subjective sense of pain, and the objective symptoms are inconsiderable, provided the peritoneum is unaffected, as so often happens with simple moderate parametritis. Hence the slight initial state of illness is usually regarded as a brief attack of milk fever, or is attributed to the uterus continuing sensitive after the exertion of labour, or possibly to painful "after-pains"; the subsequent distinct local trouble being supposed to arise from subsequent injurious influences.

Quite recently J. Voit (*Zeitschrift f. Gch. u. Gynäkologie*, vol. vi., Stuttgart 1881) has published some observations in regard to puerperal infection, in which there was a longer period of incubation: the disease usually broke out after the 4th day *post-partum*, and was usually distinguished by its favourable issue. The fact that the women concerned were not examined after the completion of labour, excludes any possibility of subsequent infection. I also, in some cases in which the lying-in women had left their bed prematurely (*i.e.* 3—4 days after delivery), have seen sudden symptoms of endometritis and pelvic peritonitis set in, accompanied by a rigor and by high fever; but I could not decide whether the outbreak was accelerated by the getting up (the infection having occurred previously and till then been latent), or whether a fresh infection had been produced by a fresh lesion of the genital mucous membrane, or by the access of air to the latter.

§ 856. The first and most persistent symptom of puerperal fever is of course *fever*. Premonitory symptoms are exceedingly rare; indeed it is only in cases of acute infection that the restless condition, and the expression of face that denotes illness, may be met with at an early date. The fever is as a rule ushered in by a more or less severe *rigor*, after which the temperature will at once be found to be very high. The rigor indicates a sudden rise in the heat of the body, a sudden increase in the oxidation processes going on in the tissues and blood, caused by absorption of the poison. Where therefore the virus is only introduced by slow degrees, the rigor may be wholly absent; and this happens most often, where the fever is due to the gradual and persistent absorption of simple products of putrefaction, such as are sometimes present in the uterine cavity. It is rare for the rigor to recur; where it does, we must suppose that a further quantity of the virus has been absorbed. Accordingly, repeated rigors are only met with in cases of venous sepsis, where thrombi break down afresh, and where emboli continue to migrate into hitherto unaffected tissues. I need scarcely point

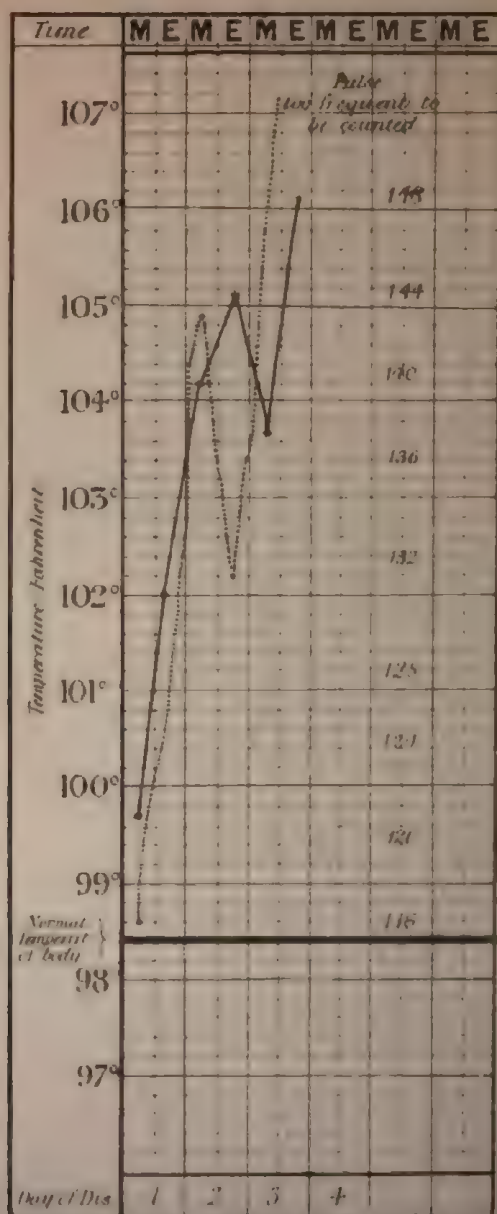


Fig. 123.—Acute lymphatic septicaemia, beginning immediately after labour. Death on the 3rd day after the latter¹

¹ The continuous line indicates the temperature, the dotted one the pulse. The days of illness are calculated from the day of delivery

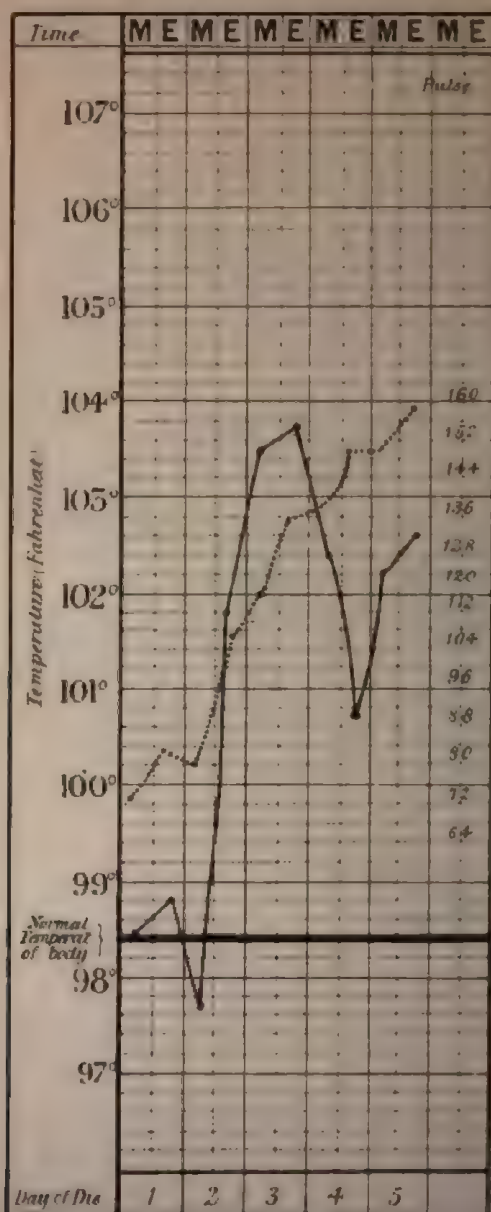


Fig. 124.—Lymphatic septicæmia, beginning on the second day after delivery. Death on the fifth day¹.

¹ The continuous line indicates the temperature, the dotted one the pulse. The days of illness are calculated from the day of delivery.

out that it is not every rigor in a lying-in woman that has such an ominous significance. There are many other disturbances in the equilibrium between production and loss of heat, and many other disturbances of the vaso-motor centre, that may give rise to the same phenomenon.

The height, variations, and the characters of the fever depend upon the intensity of the intoxication and on the local affections. Indeed with acute septicaemia the fever may wholly disappear, and the temperature sink to a low level; for the fever does not so much depend on the continuance of the poison in the blood, as on the pyrogenic action of that poison, and on the inflammatory changes it produces in the affected organs. If therefore these changes do not take place, no fever will be present; indeed before long the temperature may resemble that of collapse, if the functions and metabolism of the tissues, as well as the circulation, are greatly weakened by the acute and intense intoxication.

The frequency of the pulse is not in any way characteristic. I may however mention that it is a more valuable prognostic sign than is the temperature, excepting where extremes of the latter are present.

The onset of fever, especially if accompanied by a rigor, is almost always associated with pain in the abdomen, beginning in the hypogastrium, and with moderate tympanites. This pain depends upon irritation of the peritoneum, varying in proportion to, and presenting all the characters of, such irritation. Sometimes the pain is at first still rhythmical (like after-pains), a feature which indicates participation of the uterus.

I cannot enter further upon the symptoms, without describing the various types of puerperal fever. I proceed therefore to discuss the phenomena, which characterise the principal varieties of the disease.

§ 857. I begin with those of simple, and especially acute, septicaemia, both lymphatic and venous.

The lymphatic variety (figs. 123 and 124) begins very soon after delivery, and always with a rigor; I at least have never seen that symptom absent, but it only occurs once. The temperature will at once be found very high (40° C. = 104° F., or more), and subsequently varies but little; the pulse is very frequent, and proportionately thin. These characters persist.

The abdomen rapidly grows distended, without becoming particularly painful; at most is it somewhat so in the uterine and para-uterine regions; indeed the persistent painless meteorismus (due to paralysis of the intestinal muscles) is characteristic of the acute lymphatic sepsis, and is therefore in the highest degree an ominous sign. There is no peritoneal effusion in the most acute cases, and even where it is probably present after 1—2 days, the meteorismus prevents its detection; only when of longer duration, does the existence of fluid become distinct. But even where such effusion is present, tenderness is absent; or at any rate it is very slight in comparison to the degree in which the peritoneum is affected, the effusion being not so much a secretion as a transudation, containing masses of mycelites. Meanwhile the tongue is moist, rarely thickly furred; it may be quite clean. Constipation is present; where diarrhœa occurs, it has usually been artificially produced, and is then difficult to check. The skin is invariably bathed with perspiration.

Before long the symptoms of collapse become still more patent. The pulse grows more frequent (140—160), and still more wretched; the temperature does not keep pace with it, indeed is often inclined to sink. Respiration is shallow and hurried, the body is bathed with clammy sweat, and the extremities grow cold. Nevertheless the patient as a rule takes the most hopeful view of her case (euphoria). Many women will not, and, if it were not for the dyspnœa, the majority would not, believe that they are so dangerously ill. Most of them right on to the end have no suspicion of their true state. Death generally occurs between the 4th and the 7th day, but not infrequently much earlier. The time of course depends on the acuteness of the poisoning.

The *venous* variety of septicæmia, generally speaking, shows itself much later than does the lymphatic, and indeed is not infrequently merely superadded to the primarily slighter forms of the latter. It may however, as mentioned above, develop independently and very early. The onset of fever is as a rule not so sudden; the temperature rises more gradually, and continues to do so, until the maximum is reached at the time of the first rigor (fig. 125). This rigor is very acute and prolonged, and is succeeded by a feeling of heat and by perspiration, after which the temperature sinks more or less rapidly almost to normal, very much as

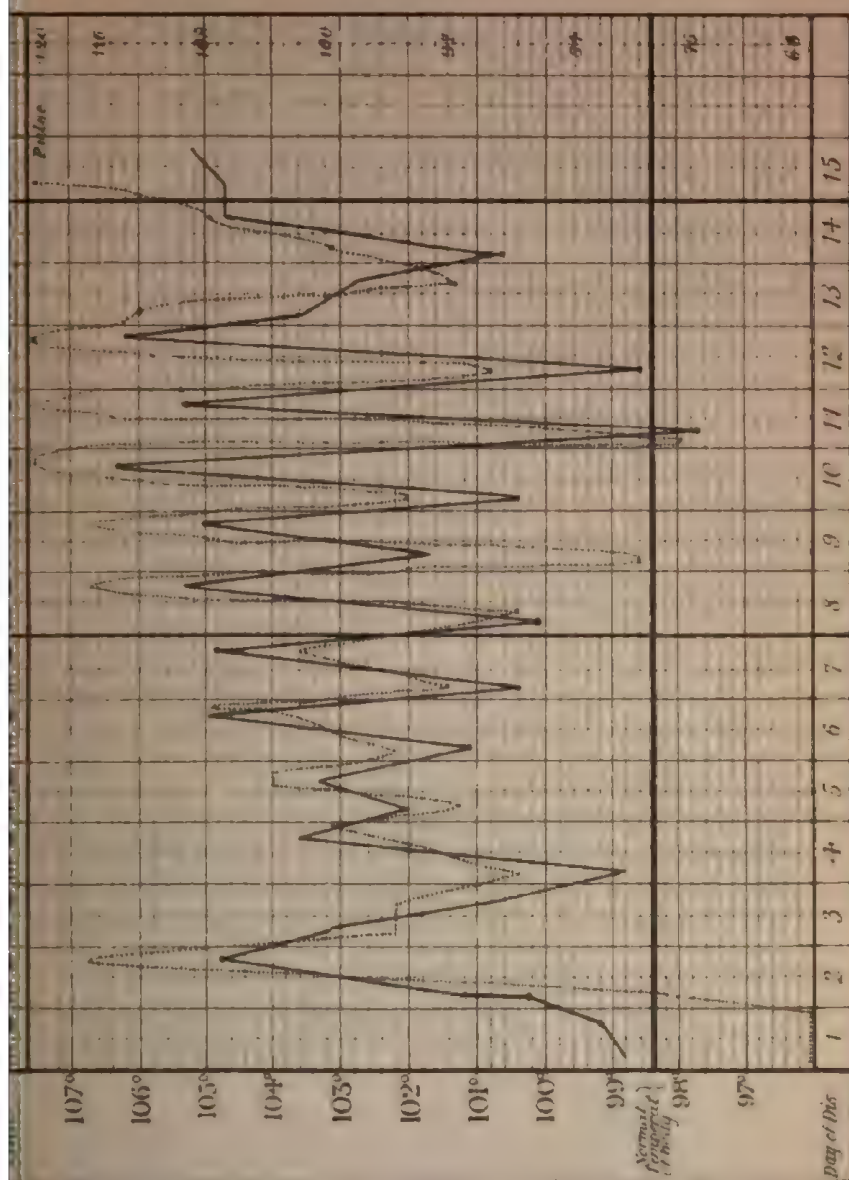


Fig. 125.—Phlebitic septicemia, beginning on the evening of the second day after delivery. Death was caused by embolic processes on the 15th day¹.

¹ The continuous line indicates the temperature, the dotted one the pulse. The days of illness are calculated from the day of delivery.

after a severe attack of intermittent fever. A period of remission follows, in which the internal temperature is not extraordinarily high, and in which it distinctly undergoes the usual diurnal variations; the patient feels pretty well, until quite unexpectedly the rigor returns. The pulse in many cases varies *pari passu* with the temperature, while in others it continues frequent and full, although not much above the average. In contrast with these typical examples of erratic rigors and of intervals (remissions) of apparent improvement, other cases are met with, in which no such rigors and remissions appear, in which the patient has more the appearance of one suffering from typhus, in respect to the variations of temperature (the internal temperature however continues high), to the small, often wretched, pulse, the apathy, the drowsy and slightly delirious condition, the dry skin, the dry sooty tongue, the moderately distended abdomen, the occasional hæmorrhage from the uterus, and the tendency to diarrhœa. Repeated rigors are generally caused by a fresh immigration of emboli, and we know that such processes are not essential sequelæ of ichorous destruction of thrombi. This variety, in which the condition becomes more or less typhoid, is the purest and most acute form of venous sepsis.

Local affections are rarely absent. The uterus, especially its inner surface, in which the process frequently starts, is almost always affected, or else there is parametritis. Peritonitis however usually remains absent; indeed the fact of the peritoneum continuing unaffected, and of the abdomen being flat, soft, incompressible, and often totally insensitive to pressure, offers a marked contrast to lymphatic septicæmia. On the other hand, if the attack is not very acute, thrombotic changes, *i.e.* metastatic affections, soon show themselves in other parts of the body. Indeed, generally speaking, the progress of events is much slower than with lymphatic sepsis, corresponding in this respect with the later development and the times of remission. The only exception occurs with the typhoid cases, which depend on decomposition and destruction of the thrombi; these rapidly end fatally. The others may end in recovery, provided no very vital organs are secondarily involved.

The reader will gather, from what has been said above, that combinations between the lymphatic and venous varieties are not rare. They are met with in protracted cases, and begin with

the symptoms of the first form, peritonitic and phlegmonous phenomena being therefore present from the outset. The phlebitic characters are only added at a later period, so that the accoucheur will almost always be able even at the bed-side to recognise and clearly to classify any particular case.

Septicæmia, caused by prolonged absorption of the products of putrefactive decomposition in the uterus, is very similar to venous sepsis without erratic rigors. But the symptoms are much milder, at any rate at the outset, and when they grow severe, do so gradually. In such cases moreover metastatic inflammation may follow, owing to the vessels being affected. The uterus is always involved at these times, while the other phenomena closely resemble those which can be provoked, by artificially injecting putrefactive matters into the blood. This form of pure septicæmia is the one most frequently cured, the more often, the earlier the putrefactive foci can be removed from the generative organs, and the less secondary damage has been done. Sometimes such removal suddenly cuts short the whole of the symptoms.

§ 858. *Puerperal wounds and endocolpitis* are characterised by the presence of false membrane on the torn and bruised surfaces, or by ulceration of those surfaces; around them is an inflammatory œdema, especially of the labia, and usually on one side; or else one side is worse than the other. There is moreover a thin, purulent discharge, scalding and pain during micturition and defecation, and a moderate degree of fever, the height of which depends on the extent of the local inflammation, when it is not mainly due to the general infection. The ulcers usually become clean within about a week, the swelling of the vulva decreases, and the pus that is discharged grows thicker and more scanty. The ulcers cicatrise slowly, sometimes leaving painful scars behind them.

Endometritis may be recognised by the flabbiness of the uterus, its delayed involution and sensitiveness to pressure, by the severity of the after-pains (when the disease has developed at an early period), as well as by their duration. At first the lochial secretion is frequently arrested for a short time, this being either due to an obstruction of the uterine orifices (by flexion, clots, or remnants of fetal membranes), or to the dryness of the inner surface of the uterus, which accompanies the commencement of

the septic mischief. Obstruction mainly reveals itself through frequent and very severe after-contractions, caused by the efforts of the uterus to expel the retention masses (*cf.* §§ 799—800). Moreover the lochia are always offensive. The bladder and large intestine not infrequently suffer at the same time.

The further symptoms merely depend on the character of the endometritic processes. If there is simply suppuration of the wound (the so-called catarrhal endometritis), the fever, general illness, local sensitiveness, peri- and parametric irritation will be only moderate, if present at all; recovery is rapid. If however the retained masses putrify, the usual symptoms of ordinary putrid intoxication, which were mentioned above, show themselves, and hæmorrhage generally recurs. Well marked septic endometritis is never an independent affection, but always associated with the lymphatic or venous form of septicæmia, and consequently the symptoms of this disease, *i.e.* pelvic phlegmon, peritonitis, and more strictly pyæmic processes, give its characters to the illness. Compared with these, the symptoms belonging to the uterus, fall into the background.

§ 859. The difference between simple inflammation and suppuration of a wound on the one hand, and septic processes on the other, is more obvious in the case of *parametritis* than with any other local affection. In the former case we have, even from a clinical aspect, merely to deal with a localised circumscribed disorder, while in the latter the symptoms of peritonitis form the predominating feature. With only slight septic infection however, inflammation of the peritoneal and of the areolar tissues round the uterus may be combined in various ways. For we must cling to the fact that a participation of the peritoneum is always a sign of the septic origin of the disease.

Simple *circumscribed parametritis* usually begins on the 3rd or 4th day, and is ushered in by a rigor, if there has not already been a rise of temperature. The latter quickly becomes very considerable, the pulse is accelerated, and the skin hot. Where the serosa is unaffected, there may be no sharp pain in the region of the uterus, but a dull pain is not uncommon. Before long however the subcontinuous or remittent pyrexia subsides after one or two exacerbations, and may soon entirely disappear. Swelling round the genital canal only grows distinct, where considerable infiltration has occurred. Not infrequently nothing

can be discovered apart from a moderate fullness at the affected area, and apart from the fever.

Where however there is infiltration, the practitioner will be able in the deeper portions of the pelvis (at the side of the cervix and vaginal fornix, externally as a rule it is only discoverable on careful bimanual exploration) to feel a swelling, which at first is doughy, but afterwards grows harder, and which is either diffuse or circumscribed, and sometimes surrounds the cervix in the form of a semi-circle; even when bulky, it is never sharply marked off at the lateral wall of the pelvis, but seems rather to be directly continuous with it. When deep-seated, this swelling forces the vaginal fornix downwards, extends beyond the level of the external os, pushes the uterus towards the opposite side, and renders it more or less fixed. But even from the beginning it may be situated higher up, and then the infiltration may be felt *ab externo*, generally above Poupart's ligament and immediately beneath the anterior abdominal wall in the iliac fossa.

In mild and simple cases the results are very favourable: absorption rapidly ensues, although some induration frequently remains in more protracted cases. Relapses are not uncommon in the latter, and are always accompanied by a rise of temperature, until the tumour has ceased to spread, and has grown hard; the infiltration only gradually disappears. At other times suppuration follows, the earlier and more certainly, the greater the injury in and about the parametric tissue, and the more freely the wound has been exposed to putrefactive germs. These cases then begin to resemble septic disorders. The pus sometimes forms at a few, often but little extensive, spots, when fluctuation can never be distinctly made out; or else it collects in one or two larger abscesses. Perforation into the rectum, or vagina, or bladder, sometimes too above Poupart's ligament, then occurs quite unexpectedly, after persistent but moderate fever accompanied by occasional exacerbations and by tenesmus and diarrhoea, rupture affording great relief. In one fatal case I have seen a right-sided abscess burst into the cervical canal with an opening as large as a small pea. Even then however in the great majority of cases recovery results, although even at a late period such abscesses may lead to peritonitis, pleurisy and septicæmia. Indeed everything that can be said of the non-puerperal affection, may be said of the progress of the at first

circumscribed parametritis; but this is not the place to give its description.

With *septic, lymphatic parametritis* (erysipelas para-uterinum malignum), the local symptoms are much less distinct and grave than in the form just described. The septic infection and peritonitis control the whole aspect of the case from the very first; indeed the mycetes may have caused but few local changes, before filling the serosa and gravely damaging the fluids of the body. It is quite exceptional for the septic pelvic phlegmon to prove fatal, without the mycetes having affected the peritoneum. Hence too the clinical picture of this disorder coincides with that of acute lymphatic sepsis or of septic peritonitis.

§ 860. *Pelvic peritonitis* also begins with a rigor. This is immediately followed by a sharp spontaneous pain in the uterine and para-uterine regions, which are found to be very tender on the slightest pressure, and over which the abdominal walls are tense. After 1—2 days, especially if the woman is kept quiet, the pain and fever subside, when the symptoms of parametritis usually make their appearance. But if no parametritis follows, an exudation will be found behind the uterus (rarely in front of it), and having sharp contours corresponding to those of the peritoneal pouches. In not a few cases however, even that condition cannot be discovered, owing to its being but slightly marked; nothing remains except adhesions and pseudo-membranes, which are generally inaccessible to palpation, although frequently found *post mortem* in multipare. Where there is an exudation, which can be felt with the finger, it is usually in time shut off; the fluid becomes encysted and in time inspissated and absorbed. Relapses however are common, and during, or as a result of, these, perforation into the neighbouring cavities occasionally occurs, or even into the general abdominal cavity. A marked rise of the temperature always points to such relapse.

Severer cases of pelvic peritonitis do not differ materially from diffuse peritonitis, and are very commonly merely the forerunner of the latter. The attack is frequently very acute at the outset, but the speedy subsidence and the corresponding local conditions prove the disease to be limited in extent.

Diffuse peritonitis may be divided into two principal varieties, both as regards onset and progress, of which the first and usual one is entirely similar in character to the non-puerperal, while

COOPER MEDICAL COLLEGE,

FRANCISCO, CAL.

be removed from the

the other from its outset bears a well marked septic character. Of course numerous gradations and intermediate stages between the two varieties occur.

The usual course of events is as follows: the attack begins with an intense rigor, which is followed by high fever, with a temperature of over 40° C. (104° F.), and a very rapid pulse. At first the latter is very hard, resisting and suppressed, but soon it gets small and wretched. There is much head-ache, the face is flushed, and respiration hurried; the skin is burning, thirst is great, there is also nausea and occasional vomiting of green matter. The abdomen rapidly gets distended, the pains which start in the hypogastrium, soon spread over the former; they are persistent, lancinating or tearing, frequently colicky, but sometimes more of a dull character. The woman cannot bear the least touch, keeps on groaning, and complains of a sense of anguish. There is usually obstinate constipation. Either rapidly or gradually symptoms of collapse supervene, the expression of the face alters, the skin grows moist and cool, the pulse still more frequent and thready; the vomiting increases, and sometimes cannot be checked. At last death closes the scene, sometimes after a day or two, sometimes not till the end of a week. Recovery however is also possible, and heralds its approach by an improvement in the pulse, by a cessation of the vomiting and of the abdominal distention; but it never occurs, when once symptoms of collapse have appeared.

The more intense the infection, the less does the condition resemble that portrayed above, and the more does the general condition bear the impress of acute septic phlegmon. The peritonitis then presents all the symptoms described above under acute lymphatic septicæmia. A large transudation may be found in the abdominal cavity, without the abdomen being especially painful, but the flatulent distention will probably never be absent. A few observations pointing in a contrary direction, are to be explained by the fact that they were not cases of true peritonitis, the peritoneal effusion merely consisting of numerous bacteria that had immigrated, and that had been looked upon as a product of peritonitis (§ 850).

§ 861. The above is merely a rough sketch of puerperal fever, and does little more than point out the landmarks. I have no room here to discuss in detail the symptoms and progress of all

the numerous secondary disorders. In fact such a course would involve a needless excursion into the field of special pathology and surgery, inasmuch as puerperal inflammations and metastases exhibit no special features. Moreover the main *characters of the puerperium*, namely uterine involution, after-pains and lochia, have already been referred to, both just above and in earlier sections (§§ 798—800), so that here I shall content myself with again warning the practitioner against regarding the condition of the *lochia* as of any special diagnostic and prognostic importance, as is still so frequently done in general practice. Such condition merely indicates the state of the inner surface of the uterus, and does not always do that much. Even granting that that surface is usually altered in puerperal fever, such alteration need not reveal itself in the lochial secretion. Serious disease may be present, where the flow appears to be healthy, while conversely decomposed lochia do not always prove that infection has occurred.

Nor is the influence of puerperal fever on *lactation* by any means constant or definite. In the majority of cases infection has occurred before the establishment of the lacteal secretion, and in not a few even the outbreak of the disease has preceded it. In many such, and they are the worst, cases, the breasts do not become functional at all, or if they do, their activity ceases after a few days. In mild attacks, on the other hand, the secretion may come on and last for the normal period; so that its condition mainly depends on the gravity of the attack. Occasionally too it happens that the secretion, which has been hindered or interrupted during the illness, again becomes copious and free after recovery, provided such recovery is not unduly delayed.

§ 862. The diagnosis and prognosis must be made by studying the symptoms above described, and the information they yield.

In regard to *diagnosis*, it is especially important not to forget that any of the non-puerperal diseases may occur in lying-in women, and that diseases of the generative organs, which have already lasted for some time, may, if aggravated by the post-partum state, possibly lead to diagnostic errors. The woman's previous history should therefore be enquired into, and all indications systematically investigated. As soon as the practitioner

is convinced that puerperal disease is present (and he will not long remain in doubt), he must next decide whether the case is one of septic infection, or caused by the suppuration of a wound. A careful enquiry into all the particulars of the case, and a correct application of the description given above, as well as the course of events will almost invariably soon settle the question. If the disease is reigning endemically, *i.e.* within a circumscribed field of distribution, almost all the attacks, that occur within that field, will probably be due to infection. At the outset however it may be very difficult to arrive at a clear decision; especially is it so with single sporadic attacks, where there has been but very little meddling during delivery, and where the source of infection is obscure. The time at which the fever commences is then the best landmark. In infective disorders the fever always begins early, since the inoculation occurs during, or immediately after, parturition, and the incubation period is very short; in other cases on the contrary, the period of the attack is comparatively late. It must also be borne in mind that the so-called purely traumatic affections, which depend on suppuration of a wound, generally speaking present much more marked and apparently severer local symptoms than do the septic.

Prognosis is good, where the disease depends upon suppuration of a wound, but bad in cases of septic infection. On the other hand in the case of the first, local affections frequently leave sequelæ behind them, being rarer in those cases of the second group which have ended in convalescence. The rate of mortality, and its relation to the number of attacks cannot be stated in regard to the septic cases; in consequence of the great diversity of nomenclature that has hitherto prevailed, and of the fact that so many cases are interpreted subjectively, a really useful basis has hitherto proved unattainable. We shall only be able to find such basis for the calculation, when competent investigations have furnished us with a true insight into the morbidity of the puerperium, when puerperal fever has been included in the list of contagious diseases, and when, lastly, precise physical conditions are relied upon for the diagnosis.

In any individual attack the prognosis is usually an easy matter, if all the symptoms are carefully reviewed. Acute septicaemia, whichever form is present, probably always proves fatal. The

earlier the disease breaks out, the more the peritoneum seems affected at the outset, the more unfavourable, generally speaking, are the prospects. They are more favourable, the more and the longer the morbid processes are confined to the pelvic organs. Nevertheless recovery may occur, even where the condition appears most unfavourable. I have seen a woman recover after losing both eyes, and after suppuration of both knee-joints; the prospects of life mainly depend on the importance of the organs that are secondarily attacked. Metastases into peripheral regions are generally not to be regarded as symptoms of the utmost gravity. But conversely, even in the apparently mild cases, it is well to be cautious as regards prognosis, until the progress of events justifies a distinctly favourable verdict.

d. Prophylaxis and Treatment.

§ 863. The hope of getting rid of infection, after it has occurred, and of promoting a favourable result, is an object whose attainment is always highly problematical. Hence the great aim of therapeutics must be to prevent infection. A correct prophylaxis has to see: 1st, that the wounds, which accompany delivery, are restricted within the narrowest limits possible; 2dly, that there is as little opportunity as possible for the introduction of the poison; and 3dly and mainly, that every infective and putrefactive germ is kept at a distance from the genital tract. Everything must be done to facilitate the progress of delivery, as far as is practicable; only such manipulations must be performed in the parturient passages as are absolutely necessary, and midwifery must be practised with scrupulous clean hands and arms, clean instruments, clean linen, clean clothes of toilette, and in pure air.

§ 864. The first of these three indications is least under our control. We cannot always prevent severe spontaneous labour, we cannot always diminish the pressure of labour as we would like, since we are unable to remove the resistance which is presented by the fetus, merely out of consideration for the mother, nor can we always in the cases in question deliver the fetus, without serious damage to the mother. All the measures which are included in prophylaxis, depend on the physician's experience and skill of the accoucheur.

The *second* indication might appear superfluous, if the third could be fulfilled in a perfectly satisfactory manner; for examinations and operations cannot infect, where clean hands and apparatus are used. But unhappily we cannot be absolutely certain that hands and apparatus, that are clean to begin with, may not be again contaminated during the course of delivery, more especially by repeated contact with the contents of the genital tract. At all events the oftener the hand is introduced into the genital passage, even if only for the sake of exploration, the more injuries will be produced. Labours, which are conducted by students (male and female), but especially by examination candidates, who take every possible pains not to overlook any change in the progress of labour, offer the best examples of the risk that accompanies too frequent examinations; for it is a proven fact that an unduly large number of these women sicken after confinement. The accoucheur should therefore adopt the plan of making his first examination so thoroughly, that a repetition will only appear necessary, when the external phenomena and especially the external conditions of the uterus definitely require such. Nothing is more objectionable and indeed repulsive than the almost incessant palpation and manipulation within the vagina, about the os uteri and the vulva, which midwives are usually so fond of resorting to, when the labour does not advance as fast as they wish, and when the fœtus begins to stretch the pelvic floor. I cannot insist too strongly on the danger, which this custom causes to lying-in women, and particular attention should be drawn to it by the teachers of midwifery. Where too frequent examinations are avoided, and most teachers now lay stress upon such avoidance, the beneficial results soon show themselves very distinctly in the satisfactory state of health of the women under treatment. Nor does diagnosis suffer from this course. Any one who has made himself familiar with the method of external examination, and has learnt by its help to interpret the corresponding conditions of labour, will soon know, when a fresh intra-vaginal examination has become necessary. Further, the same care is required during the first period of the lying-in state as during delivery; internal explorations must not be made by the midwife, and only by the medical attendant, when definitely demanded.

The *third* indication is so obvious, that I need not waste many

words in dealing with it. The accoucheur must not merely satisfy himself, that his hands and apparatus are clean; he must avoid having anything to do with infectious patients or with the products of disease, shortly before conducting the labour. More than this, his own person and everything that he uses, as well as the genital tract of his patient, must frequently and at the time of each examination be carefully cleansed and disinfected. The ideal of midwifery would be to conduct a labour wholly antiseptically, like a surgical operation, according to Lister's method. This however is not at present possible, and will probably never become so. The proposals and attempts, which have hitherto been made (*cf. inter alios* Fehling, *Archiv f. Gyn.*, viii., p. 298, and Stadtfeldt, *l. c.*, who allow confinements to take place under spray; Schücking, *Centralblatt f. Gyn.*, No. 3, 1877), are impracticable. Nor as a matter of fact is such a course necessary. If only everything concerned is clean, and if the genital organs themselves are disinfected, all requirements are satisfied.

§ 865. The following are the principal points to be attended to.

If the practitioner has just been in contact with suppurating wounds, with dead bodies or infectious disease, it is his duty either to decline to conduct the labour, or at least, before he goes near his patient, to disinfect himself and his clothes as thoroughly and conscientiously as possible (*cf.* § 190¹). Midwives therefore, who, when summoned to a labour, are as a rule obliged to obey, ought not to act as monthly nurses, and above all ought not to nurse any sick lying-in woman; they should only practise midwifery in the narrow sense of the term. If they are nursing a lying-in woman who is ill, they must decline any summons to a labour.

On reaching a parturient woman, the accoucheur must thoroughly disinfect the genital tract of the latter, as well as the arm that is to make the examination, and this must be

¹ The fact that § 190 has been in type for a long time, prevents me from altering the above statement. But I may remark that at a later period Spiegelberg, like Volkmann (*Centralblatt f. Chirurgie*, 1880, No. 26), Ahlfeld (*Centralblatt f. Gynaekologie*, 1880, No. 16) and Macdonald (*Brit. Med. Journ.*, 1880) *inter alios* adopted the view that it is allowable for a medical man to undertake a labour immediately after being exposed to infective matters, provided that he has taken every pains to disinfect himself (if possible, more than once), before examining the parturient woman. This however is only to be permitted to medical men, who understand the use of antiseptics. Midwives should on no account be allowed such liberty. (W.)

done, *before any vaginal exploration is undertaken.* This matter has already been referred to in § 190, but here I must once again insist on the necessity of continuing this prophylactic disinfection of the genitals during the whole labour, particularly during the period of dilatation. Not only must the bed and linen be clean, and the air in the room be pure, but the external genitals of the parturient woman must be washed with soap and carbolic lotion. Moreover both before and after the first, as well as after each subsequent, examination, the vagina must be irrigated with a tepid 2 p. c. carbolic lotion, in order that any matters that are stagnating in the vagina, and that any air that has been admitted into it at the time of the exploration, may be removed by irrigation, while the air which remains is at the same time disinfected. Further, the examiner must wash his hands and arms in strong, at least 3 p. c., carbolic lotion¹, and thoroughly brush them, using soap and a nail brush. Fingers and nails must be brushed with special care in a strong solution of carbolic, all foreign matters lying between the nail and its bed, being most scrupulously removed. He should with equal pains disinfect his hands and arms *before each subsequent examination*, quite as carefully as before the first one; and not act as if he believed, as so many do, that a single disinfection suffices for the whole course of labour. Further, it is a good plan for the accoucheur either to take off his coat, or at least to turn back a good part of his sleeves, including those of the shirt, since infective materials not uncommonly adhere to them. If the midwife comes direct from another confinement, she must change her clothes, or else, if this is impossible, disinfect her arms all the more thoroughly. Before an examination is made, and every time it is repeated, the fingers and hands should be anointed with some preparation containing carbolic acid, preferably with carbolised oil or carbolised vaseline. What has been said in regard to the fingers applies, with still more force, to catheters and irrigation tubes.

The vaginal irrigation should invariably be repeated at the conclusion of labour, whether this has terminated spontaneously

¹ Other disinfectants may also be used, for instance salicylic acid, permanganate of potash, hypochlorite of soda, one of the hyposulphites, or aqua picis (*Theophrastus* of the German Pharmacopœia; tar one part, to be agitated with 10 parts of distilled water). But carbolic acid is the most reliable, for it has the advantage of revealing its presence by its smell, and of to some extent disinfecting the surrounding air. It is in most general use, and deserves to be so.

or with artificial help. If the hand has been introduced into the uterus, or if the child has died some time before expulsion, the uterus also should be irrigated after delivery¹.

All external injuries of the generative organs must next be bathed with carbolic lotion and sewn up; whether this is done with silk, or wire, or catgut seems immaterial, in the present state of our knowledge. It is unnecessary to sew up the tears under spray, especially if the wound is kept constantly irrigated, while the sutures are being inserted. Contused wounds, which cannot be sewn up, should be covered with carbolised cotton wool, or with rags dipped in 10 p. c. carbolic oil, a perfectly clean diaper being laid over the vulva.

I need hardly point out that it is quite as necessary to keep the lying-in woman and her surroundings perfectly clean and pure *after*, as it is during, delivery. *The genital canal itself however should now be left alone, provided that there are no putrefying matters in it, and that there is no pyrexia that calls*

¹ The above-described mode of disinfection has answered very well during the last 3 years in the Gynaecological *Clinique* at Breslau. Between 1878 and 1881, 8 out of 904 lying-in women died from infection. Of these 8, 2 were already infected, when brought into the Maternity; a third, who was suffering from eclampsia, had been examined before admission, and may possibly have been brought in already infected. Including the last case therefore, we have had 6 cases of death in the *Clinique* from puerperal fever, amounting to a mortality of only '66 p. c.

Equally favourable are the statistics of morbidity in our *Clinique*. Serious affections of the genitals (exudations &c.) have been extremely rare; indeed almost the only cases met with were slight attacks of endometritis, or absorption fever secondary to puerperal ulcers. Including all these, even the mildest, cases, in which there was a slight rise of temperature (over 38° C.=100·5° F.) for a few days, the average number of diseased women in those 3 years was only 97=10·7 p. c. This bill of health is all the more noteworthy, since in this hospital students, who are in contact with infective matters (cadaveric poison &c.), are allowed without exception to take midwifery cases. Nevertheless, in spite of these favourable results, I do not regard the complicated system of disinfection explained above, as absolutely indispensable, and I believe that as far as the disinfection of the parturient woman is concerned, it is sufficient, if her external organs are cleansed, and if her vagina is thoroughly irrigated (with at least one litre=33·2 pints of 2 p. c. carbolic lotion) before the first examination, and if the irrigation is invariably repeated after the conclusion of labour. I consider it superfluous to resort to irrigation after each examination, since equally good results are obtainable without such repetition (*cf.* for instance the brilliant results of Breisky, *l. c.*), if in other respects perfect cleanliness is attended to. On the other hand repeated vaginal and uterine irrigations are imperatively called for, whenever putrefactive symptoms show themselves in the uterus during delivery, and where such delivery cannot be immediately terminated. Indeed in lying-in hospitals it may be well for the sake of precaution to repeatedly irrigate the vagina, even in normal labour; but midwives ought not to be trusted to do this, since they are usually not sufficiently intelligent, or too slovenly, to carry out the necessary proceedings, according to strictly antiseptic principles. (W.)

for interference. The wound products of the genitals are of themselves not injurious. I consider it bad practice to irrigate, except on definite indications, since such irrigation merely offers another opportunity for fresh injury, and for interference with the healing of the wounds. Only too often have I convinced myself that such meddlesome treatment does harm. Indeed I believe that even after difficult labours, or when an epidemic is raging in the hospital, prophylactic irrigations of the puerperal uterus are unnecessary. They should only be resorted to, when symptoms of putrefaction in the genital canal appear; but then they are desirable, even if no local disease has as yet shown itself, and even if there is either no fever at all, or only a very slight febrile disturbance. This indication however will often arise, however many precautions have been taken during delivery, where operations and intra-uterine interference have been required, or when a portion of the foetal membranes or decomposed liquor amnii has remained behind. At such times the irrigation and disinfection of the whole genital tract is of enormous prophylactic value. It may frequently prevent cases of so-called auto-sepsis, and severe suppuration, or at least diminish the intensity, or cut short the attack. Here however we are encroaching on actual therapeutics.

§ 866.

The Treatment

to be pursued, where puerperal fever has broken out, i.e. where infection has occurred, should have as its primary aim the removal and destruction of the infective matters, that have gained access, and that are continuing to develop. The local treatment of the genital organs therefore ranks first in importance. If we could thoroughly expose those organs, and thus render them freely accessible, we should doubtless in the majority of cases be able to prevent the further extension of the infection by energetic local measures. But inasmuch as this is unhappily beyond our power, all we can do is to cleanse and disinfect the genital canal. If by this means any putrefactive products and infection germs that are already present, and those that are continually being formed afresh, are removed, the continued absorption of poison into the tissues and juices will be checked, with most beneficial results. It would however be too much to hope that every case

of septicæmia can be cured, as some writers appear to teach, if we judge by the tone of their most recent communications (Schede, Langenbuch and others). That will only be possible, where the disease is entirely due to the absorption of matters, resulting from decomposition in the uterus, i.e. where the disease is limited to the surface of the genital canal; perhaps the same treatment may do good, even where the mischief has spread to the tissues themselves, but this is very doubtful. Since however the practitioner can never at first be quite sure how deeply the disease has extended, he will always do well to wash out the uterus; although the irrigations will be of but little influence in the cases in which the virus has actually been inoculated into the vagina, and especially into the cervix. Every one who has seen many cases of puerperal fever, as well as the post-mortems performed on such, will agree that the number of the last category is not a small one, and also that it is not in every case of puerperal fever that putrefying lochia are present. In saying this I do not by any means wish to undervalue uterine disinfection; I am only preparing the practitioner for disappointment. And lastly I can only regard this local treatment as *absolutely* indicated, where putrefactive matters exist in the genital canal, or where the inner surface of that canal is distinctly diseased.

The *disinfection of the vagina* is so simple a proceeding, and involves so little disturbance of the patient, that it can be carried out in every case. When found beneficial, it can be continued for as long as the fever, the local condition, and the state of the wound secretions (lochia) seem to render it advisable. The best solution for the purpose is a tepid (30° — 34° C. = 86° — 93° F.), about 2—4 p. c., carbolic lotion, which is injected by means of an ordinary irrigator and either a wide metal tube, or one of the glass tubes which have been recommended by Hildebrandt in Königsberg; elastic tubes cannot be recommended, since they soon grow soft, and imbibe impurities at any point where they are bent. The glass tubes have an advantage in point of cheapness, so that even a poor woman can purchase her own tube; they are therefore specially suitable for maternities. The irrigation is performed over a draw-sheet, and there should be a moderate fall, the injection being continued, until the effluent fluid escapes pure. The condition of the genital canal must

determine how many times a day it is necessary to irrigate; 3 or 4 times in 24 hours will usually suffice, or indeed twice, where the disorder merely arises from the suppuration of a wound.

The *uterine cavity* however must only be *washed out*, where such a step is definitely called for by the condition mentioned above, the operation being always done by the medical attendant. The irrigation will usually be required twice in the 24 hours, 3 or 4 times only in urgent cases. Any air, that happens to be in the uterine tube or in the india-rubber tubing, must be expelled before the introduction. The vagina is first of all irrigated with a view to the removal of any putrefactive matters contained in it, and only then is the tube to be passed into the uterine cavity; one or two fingers should always co-operate, so as to quickly overcome any obstacle to the introduction. The thicker the tube and the wider its orifice, the better. Moreover the best material is metal, since a flexible tube bends under the influence of warmth and moisture; it should also be well curved. A double-channelled catheter is unnecessary. The solution is the same as for vaginal disinfection, the irrigator being placed 30–60 cm. (1–2 feet) above the woman, the height varying with the facility and rapidity, with which the vessel is emptied.

These intra-uterine irrigations are, broadly speaking, quite free from danger, provided that the necessary precautions are attended to. I admit that on various occasions dangerous symptoms have occurred (sudden loss of consciousness, clonic spasms, loss of pulse, rigors); indeed in the hospital here there has been a case of sudden death¹. But in comparison with the great number of irrigations these accidents are rare, and moreover they can to a considerable extent be prevented. Care must be taken not to irrigate at too high a pressure, so as not to cause any violent distention of the uterine parietes; for the same reason too the outflow of the irrigation fluid must be uninterrupted. During the irrigation therefore the operator

¹ These accidents are regarded by Kistner as due to acute carbolic poisoning, but this is a mistake, since they also accompany the use of other lotions (e.g. such as contain salicylic acid, liquor ferri perchloridi). Fritsch, on the other hand, believes that there is a direct influx of the irrigating fluid into the blood-vessels. But it is more probable that it is the irritation of the inner surface of the uterus, combined with the distention of the uterine cavity, that causes those accidents in some reflex manner, either by producing acute cerebral anæmia through some vaso-motor action (Herdegen), or by suddenly arresting the heart's action (Buntzel).

should supervise the uterus, by laying one hand on the abdomen, and stop the irrigation as soon as the uterus contracts, continuing to irrigate, when the latter has again relaxed. I cannot recommend the *permanent drainage* of the uterus, by means of elastic india-rubber tubes, in addition to repeated irrigations through the drainage tube, although the method has some advantages (it avoids the necessity of repeatedly introducing the irrigation cannula, and is free from risk of serious accident), for openings in the tube and even the tube itself are apt to be blocked, while moreover the latter affords an admirable channel for any infective germs, that lie at its free end, to pass into the uterine cavity. It is preferable, indeed the best method of all is, to adopt the mode of *permanent irrigation* suggested by Schücking (*l. c.*), by means of which any septic matters, that have been introduced, are first of all destroyed, while the entrance of fresh infective matters is prevented. Even this however will frequently prove disappointing, especially where the morbid processes have penetrated deeply. Instead of using Schücking's somewhat troublesome method, it will be sufficient to connect a thick metal catheter, which has been passed into the uterus, with a large irrigator by means of a piece of tubing, and to allow the fluid to flow out in a feeble stream. Carbolic acid poisoning need not be feared; only in one or two instances have I seen slight and very transient carboluria, and then the disinfectant was at once changed. The lying-in woman during the irrigation lies over an india-rubber funnel, which passes through the mattress and opens into a vessel, or else she may lie (as is done in our hospital here, according to Schroder's suggestion) on a divided mattress, in which case the effluent liquid is collected in a tin vessel, from which it escapes into a pail. All these arrangements however are unhappily too cumbersome to be adopted in general practice, or even in a large lying-in hospital. The only remaining method, and it is also the best for the majority of cases, is to wash out the uterus with the help of a metal or glass tube. As a rule the irrigation need not be continued for any great length of time, since the source of danger, which was situated in the uterine cavity, has almost always ceased to exist at the end of the first week, and after this period prolonged illness almost always arises from the propagation of the virus into distant organs, in which case it is no longer of any use to combat the uterine affection.

At any rate the particular circumstances will indicate the proper course to be pursued.

Although the disinfection of the genital canal is an important aid to recovery, I must strenuously warn the practitioner against any irritating intra-uterine injections. Several instances have occurred in my own practice, in which very severe symptoms followed the injection of dilute tincture of iodine, or perchloride of iron. The solutions probably caused a breach of continuity in the lining mucosa, which protected the uterine muscle. In one case both the course of events and the post-mortem appearances showed that the ichorous destruction of the placental thrombi was due to the injection.

§ 867. *We possess no "specifics", that can destroy or neutralise infective matters, when actually present in the organism.* Mercurials, mineral acids, alcohol, as well as the usual antiseptics, such as quinine, one of the hyposulphites (Polli), carbolic, salicylic or benzoic acid and their salts are alike useless for the purpose. The fact that septic germs continue to be propagated in the juices and tissues, makes it impossible to attack them with a sufficient quantity of antiseptic material.

For the same reason *all attempts to eliminate the virus from the body will break down*, as they do with all infectious diseases; while on the other hand they have the disadvantage of accelerating the collapse of the organism. This is particularly true of venesection, which used to be practised, and of its combination with transfusion (as was tried by Huter for septicæmia); also of emetics, which were at one time in France regarded as panaceas; indeed Doucet actually received a reward from the French Government for his supposed discovery of a method of curing the disease with ipecacuanha. *Purgatives*, so warmly recommended in Prague (Seyfert) and then by Breslau in Zurich¹, can alone be said sometimes to have a very beneficial effect. This fact may be explained by what we know of the way in which putrefactive poison is eliminated from the bowels, as well as by the favourable action of purgatives in cases of circumscribed pelvic inflammation, both connective tissue and serous. But in the majority of instances purgatives only do good by their influence on the symptoms of fever, while in most they are

¹ Cf. "Ueber die günstige Wirkung starker Purgantien beim Puerperalfieber," *Archiv der Heilkunde*, iv., p. 97.

at the same time prejudicial, by causing a loss of fluid, and leading to enteritis. They should be wholly left on one side with acute and extensive peritonitis, or where intestinal mischief is present from the outset. Castor oil is the best purgative, followed, since as a rule it cannot be taken for any length of time, by salts of magnesia and soda. Calomel frequently causes severe gastric irritation; and after its administration I have almost always seen an aggravation of the peritonitic symptoms.

§ 868. Apart from local disinfection therefore, treatment can only deal with *symptoms*, and our first object must be to *combat the fever*. Even if infection cannot be got rid of in this way, the danger of rapid marasmus, which accompanies high fever, can be diminished, and the system thus gains time to overcome the infection.

The best antipyretic, that we have, is the *cool bath*, or *cold wet packing of the whole body*. For a long time this treatment was shunned on theoretical grounds, through fear of checking the puerperal discharges. But the experience which I, like others, have gained during the last few years in reference to prolonged cooling, has shown how unfounded those fears were; the same view is held by Schröder (*Lehrbuch*, 6th edition), Osterloh ("Die Anwendung lauer Bäder bei fieberhaften Wochenbettskrankheiten," *Deutsche Zeitschrift f. praktische Medizin*, No. 9, 1875) and Wiltshire (*British Med. Journal*, 1878). The bath is preferable to the cold pack, as being more convenient, pleasanter to the patient and more effectual. The treatment by packing I have never seen followed by so marked, and above all not by so continued, a fall of temperature; it should therefore only be resorted to, when there are difficulties in the way of procuring baths. Cold is indicated, wherever a high fever continues, with the erratic rigors of phlebotic septicæmia accompanied by slight remissions, and whenever high fever is evidently injuring the system. As regards indication and mode of procedure, everything that has been established in regard to the value of external deprivation of heat in continued fevers, holds good for these cases also. I only consider cold as counter-indicated in cases of acute sepsis, where early collapse sets in, and where the dominant mischief is thoracic. The temperature of the bath should vary from 29°—19° (84°—66° F.), according to the susceptibility of the patient; sometimes I have gone even lower. With a view

to overcoming the unwillingness of the patient or her friends, which exists at first, it may be well to begin with tepid baths; but these must each time be gradually cooled down, or else at the conclusion of the bath cold water may be poured over the patient, as Osterloh suggests. Before long however entirely cold baths may be given; indeed as a rule after one or two trials the patients usually of their own accord ask for them. The effect of the first baths should be watched by the doctor himself, but the subsequent ones may be given by a good nurse. The time of immersion must depend on the condition of the patient; its repetition, as in the case of continued fevers, on the effect on the state of the fever, and on the general symptoms after the bath.

The local application of cold has no material antipyretic action, and is therefore only applicable, where the indications are local.

The best *internal antipyretic remedy*, next to the purgatives that have been already referred to, is *quinine*, especially the hydrochlorate of quinine. There can be no doubt whatever that it lowers both the temperature and the rate of the pulse, but for that purpose it must be given in sufficiently large doses. Even then however (for instance in doses of 2 grms.=30 grs.) the effect is not permanent, and not infrequently the temperature rises even higher than before, amid symptoms of severe quininism. Nevertheless quinine should have a trial, especially in cases of remittent pyrexia and repeated rigors. Under these circumstances it should be given in a single large dose, this being administered during the remission, and before the expected onset of fever. In other, and especially the milder, febrile attacks, small and frequently repeated doses are beneficial; they cannot do harm, and, when the stomach tolerates them, are always useful, by acting more or less on the fever and by their tonic influence. Other remedies of course may be given simultaneously.

Amongst these, *alcohol* deserves particular attention. It has long been used with benefit by English physicians in acute feverish disorders¹, and lately its antipyretic action has experimentally also been demonstrated; the reports in regard to its

¹ In reference to its effect in puerperal fever, cf. Gasserow, *Reisebericht*, *Monatschrift f. Geburt.*, xxiv.

clinical value are favourable. Too much however must not be expected of it, for mild disorders usually recover in any case, and in more serious ones the resulting diminution of the temperature is never very considerable, and never lasts long enough. On the other hand the exciting and restorative influence of alcohol must also be considered; if the general condition calls for stimulants, I know of none better than one of the many alcoholic preparations. The number and size of the doses must of course always be adapted to the existing conditions; but where it is particularly the fever that is to be combated (and alcohol is especially valuable as a change, when quinine has been given for several days), small doses should be administered frequently, a tea-spoonful or more every one or two hours. Spirits are best, especially cognac, brandy and rum; where these are refused, the heavy wines from the south, *e.g.* port or sherry, or some Hungarian wine may be substituted.

Other remedies, recommended for fever, are salicylic acid, sodium salicylate, the leaves of eucalyptus globulus, digitalis, and veratrin.

Salicylic acid (given in small and frequent doses, 3—8 grms. = grs. xlv—cxx *pro die*) seems unquestionably to counter-act fever, and to produce fewer unpleasant symptoms than does *salicylate of soda*; but I have never found the antipyretic effect last, although I should add that I have only used moderate doses. On the other hand I must warn the practitioner against the preparations of soda, since even in moderate doses they greatly disturb digestion, and in large ones or by a cumulative action are apt suddenly to provoke symptoms of collapse. Nor can I recommend *digitalis* as an antipyretic remedy; in order to have this effect, it must be given in doses, whose concomitant effects may be very disagreeable; it is only justified, where the state of the thoracic organs gives rise to unusual indications. The same is true of *veratrin*. *Eucalyptus globulus* is highly spoken of by Hertz ("Acute Infectiouskrankheiten," Ziemssen's *Handbuch*¹ 1874) and by Osterloh and Winkel (*Berichte und Studien*, i, 1874, p. 307), as a pleasant, rapidly operative remedy, unassociated with any bad effects, and one which may serve as a substitute for quinine. It is given as a freshly prepared tincture, and (in Dresden) in doses of 5—20 grms. (grs. lxxv—3 v) *pro die*.

¹ English Translation, vol. ii., p. 660 (Tr.).

§ 868. The remaining treatment, i.e. that of the other symptoms, must depend on the indications of the particular case, and on general therapeutic principles. Here I shall merely add a few special rules for some local disorders.

In regard to *puerperal sores* and endocolpitis it will be sufficient to irrigate the generative organs with some disinfectant, and to disinfect the ulcers with carbolised rags, carbolised lint &c. The membranous deposit, that is so frequently present, may be left untouched, its significance, which has been already referred to (§ 845), being borne in mind; it will in time be shed spontaneously, while cauterisation merely increases the sloughing and the surrounding inflammatory swelling. If there are extensive bruises, and sloughing is present from the first, aromatic and alcoholic lotions, combined and applied with the carbolic dressings, are very beneficial (camphor wine¹ is an excellent application); it is also a very useful plan to sprinkle the sores with iodoform. On the other hand where there is deep and extensive sloughing, it is well to begin by powdering the affected portions with a thin layer of chlorinated lime, over which warm water is allowed to trickle; when this has been done, the lotions may follow, as just stated. The chlorinated lime frequently causes severe burning for a short time, but acts very favourably on the local condition.

The *pelvic inflammation*, which is produced by suppurating wounds, mainly requires (apart from the disinfection of the generative tract) local antiphlogistic measures, together with purgatives, local abstractions of blood, and tepid fomentations, applied according to Priessnitz's method. Thiele found that permanent irrigation, continued for some days with iced water, was a very effectual local antiphlogistic measure. Leeches, applied to the abdominal walls, are most useful, where inflammation of the serosa is the principal trouble. Their number and repetition should vary with the severity of the disease, and with the strength of the woman. Tepid lotions, like poultices, are very efficient in soothing pain and diminishing tension, and are much more convenient than poultices, since they are lighter, cleaner, and do not need to be so frequently changed. A towel or a piece of flannel may be employed for the purpose, this being covered in its whole extent by thin impermeable tissue. The more deep-

¹ Cf. note on p. 321.

seated the inflammation, the warmer as a rule should the application be; the more superficial and serous, the cooler.

Where well marked *peritonitis*, of an apparently sthenic character, is present from the very first, a considerable number of leeches should be applied to the abdominal walls, a bag of ice or ice-cold compresses being afterwards laid over the abdomen. Between the bites and in their vicinity gray ointment may be rubbed in. The internal treatment of these cases of peritonitis should begin with a gentle laxative, and afterwards consist mainly in the free administration of opium by the mouth, or still better *per rectum*, in the form of a suppository; where the abdomen is very sensitive, morphia may be injected into it. Calomel is often recommended in this form of illness, but I cannot advise its use, especially as a laxative; it usually causes severe gastric irritation and colic, and thus directly counter-acts the object, which the administration of opium is intended to effect. If the peritonitis is diffuse and signs of intense infection and collapse show themselves, the application of cold and the use of opium should at once be discontinued.

§ 870. The above-mentioned treatment is not only useless, but positively injurious, in cases which from the first are evidently *septic in nature*, or which become so during their further progress. In such the disinfection of the genital canal and the antipyretic treatment is the principal matter, any special symptoms being borne in mind. Locally, very warm and stimulating abdominal applications are beneficial, especially turpentine stupes; they constitute the best remedy for early and prolonged meteorismus. Enemata of turpentine, either alone or combined with castor oil, are also valuable.

Our experience of the benefit that results, in the case of intra-abdominal operations, from a continuous removal of septic products (by drainage), leads us to anticipate similar benefit from the adoption of such treatment under the present circumstances; and as a matter of fact in a case in which I punctured and withdrew a bacteria-containing fluid from a lying-in woman, who was nearly at the point of death, I found the pulse grow stronger and an improvement set in, which lasted several hours, although it did not avert death. This is what might have been expected, for, when practised in extreme cases, even the cleansing of the abdominal cavity can no longer be of use, the whole

organism being too deeply intoxicated. Such treatment ought to be commenced early, and the difficulty lies in selecting suitable cases, and the proper moment for operating. The only thing that we can be sure of at present is that in the cases of very acute inflammation, and in those where there are numerous adhesions and fibrinous deposits, the opening and drainage cannot be of any use, but will rather accelerate the fatal issue, since in such cases it is impossible to remove the *materia peccans* from every peritoneal *cul de sac*. On the other hand I need hardly add that any encysted exudations or suppurating masses must, when accessible, be opened, just as in other parts of the body.

As regards the treatment of further localisations, I need not enter into any detail in this place. Since puerperal fever is not a specific disease, general therapeutic principles hold good in regard to it, and the proper treatment in any particular case will soon be discovered, if the various phenomena and their mode of development are carefully studied.

Puerperal Infection of New-born Children.

§ 871. No exact statements can at present be made in regard to the frequency of septic infection in new-born children; on the one hand the published observations are too few in number, while on the other both the diseases and the post-mortem appearances have frequently been wrongly interpreted. According to Hecker's paper on this subject (*l. c. sub Literature*), out of 281 children who died from disease in the hospital that is under his control, 63 p. c. succumbed to infective processes. Ritter v. Rittershain believes that the majority of cases of disease in new-born children are of septicæmic and pyæmic nature. This much however is certain, that at a time when puerperal diseases are common, the mortality of sucklings is also very high, and that the children of those women, who have perished from puerperal fever, exhibit precisely similar appearances.

The disease may either take the form of acute sepsis, with degenerative processes in all the important organs, or of sepsis in which the localisations are mainly confined to the respiratory organs, or else of septic infection starting from the navel, and accompanied by purulent infiltration of the peri-umbilical sub-

serous connective tissue, by lymphatic peritonitis, erysipelas, so-called arteritis and phlebitis umbilicalis, and by metastases.

The two first varieties of infection may occur during, or after, delivery; the last only after it.

§ 872. Infection *before* delivery, or during it, before the rupture of the membranes, is unquestionably a great rarity, since it can only occur by means of the maternal blood; it therefore involves that a woman, who is pregnant or beginning to be in labour, is distinctly diseased, and such cases are admittedly rare. True, it is not improbable that schizomycetes may be able to pass through the placental partition walls¹ (at any rate Klebs, *Pathologische Anatomie*, p. 950, takes this view). But the isolated cases bearing on this point have as yet been too little studied genetically, to allow of a definite conclusion being arrived at. Further, there is always the possibility of some other explanation being the true one, more especially as, in the cases that have been recorded, the lungs were the seat of election of the mycosis, and these organs during the period in question are still inactive, and contain very little blood in the fœtus. Epstein's suggestion, that infectious matters might pass from the maternal genitals into the liquor amnii and from there into the fœtus before delivery, without any assistance of the maternal blood, yet remains to be proved.

Nor is infection *during* parturition very common. It is still doubtful whether such infection arises through the operation of the septic matters, that may be present in the parturient canal, on any small abrasions of the skin that happen to be present, or through direct inoculation by means of the examining or operating hand. The last few years moreover have indicated a hitherto unsurmised, but more probable mode of introduction, viz. that through the *respiratory organs*. If the fœtus inhales decomposed amniotic fluid or septic genital secretions, any germs that may be present in them, will of course gain access, and infection take place through the air passages. Eberth and Orth were the

¹ I have already stated, in §§ 257 and 258, that some infective matters may be transmitted from the mother to the fœtus, as for instance in variola, according to recent observations in relapsing fever, and after vaccination. With other infectious diseases, on the other hand, the placenta offers a barrier to the poison. Thus Bollinger as well as Brancell and Davaine found such to be the case in splenic fever (Volkmann's *Sammlung Klinischer Vorträge*, No. 118, p. 1054). As far as the syphilitic poison is concerned, the question is admittedly still *sub judice*.

first to publish instances of such a genesis, and subsequently Küstner brought forward a perfectly clear case. Quite lately this mode of origin has been experimentally demonstrated by Geyl. Indeed many cases of congenital atelectasis, pneumonia and pleurisy, and doubtless many of those that seem only to have been acquired after delivery, may owe their origin to such a process.

Even *after* delivery infection may take place in the way described. This is particularly well shown by a second example published by Küstner, and by a slightly earlier one of Hecker. In such cases the contaminated air that is breathed, whether it be the general air of the room, or that which immediately surrounds the child and is directly derived from the mother, conveys the septic germs into the bronchi and alveoli. Whether these germs are able to cause infection in this way without any further aid is doubtful. Küstner has shown that it is extremely probable that, for the breath to have this effect, aspirated amniotic fluid or genital secretions are necessary, which are then decomposed by means of the breath, and thus give rise to the disease. An illustration of this is furnished by experiments made on the lower animals. If pure blood is squirted into the trachea of one of these, no septic mischief follows, unless putrid gases are also inhaled.

The view that new-born children may be infected through their respiratory passages, explains how it is that they may die from sepsis, without their mother suffering from the disease. For if the child may be infected, simply by its having inhaled septic contents of the genitalia or infected air, it clearly is not necessary for the mother to suffer, at least severely. Moreover this view enables us to understand many previously unaccountable attacks of pneumonia and pleurisy in new-born children.

But the commonest seat of infection *after* delivery is the *navel*. It does not appear to me that the remnant of the cord need necessarily have fallen off, or that any wound about the umbilicus need be present in order to permit of infection. The remnant of the cord may itself be infected, and the putrefactive germs spread from it in a central direction, and we often enough find small superficial abrasions at, and near to, the demarcation line, in which the germs might settle. Indeed we know that

infection may occur through the pedicle of an ovarian tumour that is fixed in the abdominal wound, and this must almost always happen, before the pedicle has fallen off. It seems quite possible therefore that infection may occur at the navel, either immediately, or some time, *post-partum*.

The course and termination of this umbilical infection are precisely the same, as when infection occurs through the genital tract of a parturient and lying-in woman. Thus we get a purulent infiltration of the subperitoneal connective tissue, which accompanies the umbilical vessels, a gradual spreading of the inflammatory process to distant organs, *e.g.* through the mediastinum (interstitial pneumonia, according to Buhl, Müller and others), a repletion of the lymphatics with mycetes, and decomposition of the lymph, peritonitis, erysipelas beginning at the lower half of the trunk, frequently putrefaction of the remnant of the cord, ulceration of the umbilical wound, thrombosis and puriform destruction of the thrombi in the umbilical vessels, arteritis and (more rarely) phlebitis umbilicalis, metastatic foci and effusions. These localisations are frequently absent in cases which are very acute, so that we merely get the condition of general sepsis, although even then mycotic processes in the lungs frequently show themselves in localised areas.

According to Epstein, the mucous membranes of the child, especially those of the oral cavity, constitute a not uncommon portal for the septic virus. The desquamation of the superficial epithelial layer of mucosa, which is pretty active during the first days of life, leads, where septic matters are introduced, to ulceration, as well as to sloughing and suppuration of the neighbouring glands. Not uncommonly there is septic catarrh of the oral cavity, which extends downwards. Müller believes that the poison may be transmitted by the milk during suckling; but there is no clinical proof of this.

I need not discuss the symptoms and treatment of infection of new-born children, which is almost always, if not always, fatal, especially as the description of the diseases of new-born children lies beyond the scope of this book.

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7. Puerperal Tetanus.

§ 873. This term does not include the muscular contractions, to which Dance referred in 1831 as intermittent tetanus, and which subsequently Trousseau so happily described under the name "tetany." This latter disease is not rarely seen in thin and feeble lying-in women, and depends on similar conditions to those that cause it at other times.

True puerperal tetanus must, generally speaking, be regarded as traumatic tetanus. Although rare, it is not so rare as would be expected from the infrequency with which tetanus accompanies internal injuries, including those of the non-puerperal uterus. How it arises is quite as obscure as is the development of tetanus after any external wound. Some (e.g. Sir James Simpson) have looked upon it as due to infection, secondary to the puerperal

wounds, and this view seems to have much in its favour; but it is contradicted by the rarity of the disease compared to the septic disorders, and moreover by its mainly occurring in women that are in other respects quite healthy.

Tetanus is commonest after abortion, and under such circumstances has been most often mentioned as following the artificial removal of the placenta. Atmospheric conditions (chills) seem to play a prominent rôle, and this may explain why, as Playfair (*Obstetrical Transactions of London*, xiii., p. 140) states, the disease is so much more frequent in hot climates than with us, probably quite as frequent as after surgical operations. That author, in the Lying-in Hospital at Calcutta, has seen numerous cases amongst puerperæ, who were in other respects quite healthy. It has also been suggested that there may be some ætiological relation between puerperal tetanus and renal mischief (a relation which Kussmaul,—*Berliner Klinische Wochenschrift*, 1871, No. 41 *et seq.*—first definitely pointed out); possibly both disorders may arise from the same cause (rheumatic), or else tetanus may result from a condition of uræmia.

As regards symptoms, progress and post-mortem appearances, puerperal tetanus presents no difference from surgical tetanus. The observations that have hitherto been recorded, will be found quoted in the appended literature. I may however add here that one case has been seen in the out-door maternity of 1868-9 of this town, by my then assistant Dr. Fränkel. It broke out before the onset of "pains" in a ix-para, in whom a mass of varices, situated near the knee, had burst during pregnancy, and ended fatally 11 hours after the delivery, which was completed by the forceps. The convulsions were in no way connected with the hæmorrhage.

The treatment is the same as that suited to any other case of tetanus: narcotics, curare, nitrite of amyl, &c. &c.

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PART IV.

OESTETRICAL OPERATIONS.

§ 874. The obstetrical operations, *i.e.* the various forms of mechanical interference which are peculiar to midwifery, have already been defined in the first § of PART III. (Vol. i. p. 394), and a few of them (rupture of the membranes, expression of the fetus, detachment and removal of the after-birth) have been described in the preceding Pathology of Labour. I have therefore still to deal with the artificial induction of premature labour and abortion, with version, extraction by the pelvic extremity, with forceps operations, with the various methods of lessening the size of the fetus, and with Caesarian section. Inasmuch however as the particular circumstances in which these operations are practised, have been already discussed in detail, I may here content myself with a general survey of the indications and deal especially with the *technique*. Further, I shall only fully describe those methods, which have proved satisfactory in my own hands and in those of others; anything which I regard as superfluous, unnecessary or positively injurious, will be omitted, or only briefly referred to for the sake of completeness. A history of these operations lies beyond the scope of a text book.

§ 875. I do not propose to lay down extensive general rules as regards the procedure to be adopted during operations, and shall confine myself in regard to this matter to the statement made in § 446. I may add however that the practitioner should never interfere, until he has obtained the best possible information in regard to the indications; while, on the other hand, when once an operation has been decided upon as necessary, it must be performed quickly, not in a tentative and hesitating manner, but in such a way as shall make the result as sure as possible. Again, the preservation of the child must always be subordinated to the welfare and life of the mother. Nor should the accoucheur ever forget that his hand is worth more than all his instruments,

and must invariably control the latter. Hands and utensils moreover must be kept scrupulously clean and disinfected, for carelessness in this matter may counter-act the utility of any operation, and convert what should be a blessing into a calamity.

Before undertaking an operation, the operator should consider every detail concerned in it, and make all necessary preparations. If he knows the nature of the case, and is called to a house at no great distance from his own, only those instruments, that are wanted for this particular occasion, need be taken. Under other circumstances the whole *armamentarium* will be required. This includes (*cf.* § 190) :

- A pair of midwifery forceps,
- A few fillets, with a porte-fillet¹,
- A perforator and a trephine,
- A cranioclast,
- A cephalothryptor,
- A blunt and a sharp hook,
- A pair of long dressing forceps with toothed edges,
- A metallic and an elastic catheter,
- A dressing case, including needle-holder,
- A stethoscope,
- A hypodermic syringe.

The remedies, that should be taken, are chloroform, a solution of morphia, a solution of ergotin, ergot in powder, sulphuric ether, and strong carbolic lotion.

The best position for operations is the so-called lithotomy position, the woman lying across her bed. This is always to be recommended for the inexperienced practitioner, and for the experienced at any rate in difficult cases. The bed must have such elevation as is suited to the stature of the operator, and the parturient woman must lie firmly and securely upon it, her shoulders being somewhat higher than her pelvis. When, as often happens in private practice, such an arrangement is difficult to effect, the best plan is to place a chair against the wall next to which the bed stands, in such a way that its back looks forwards, and its seat downwards, its legs being directed towards the wall. If the woman then lies against the back of the chair (which is covered with pillows), she will be well supported, while the inclination of the upper part of her body can

¹ I have never required the latter.

be regulated, by setting the chair at any angle that happens to be convenient. If a firm table is at hand, this will form a very convenient operating couch.

Not infrequently however *the semi-lithotomy position will do, instead of the complete one.* The parturient woman, while still lying on her back, is moved as near to the edge of the bed as possible. The thigh, which is next to that edge, is then raised out of the bed, and the corresponding leg (with flexed knee) placed on a stool, where, sufficiently covered, it is held by an assistant. A firm soft pillow should be placed beneath the sacrum. The operator may then either stand or sit between the thighs of the woman, and is nearly as conveniently placed as with the complete lithotomy position, while the semi-lithotomy position has the advantage of being more rapidly arranged than the former, and of not causing the woman so much distress, inasmuch as she remains in bed.

The bladder and rectum must always be emptied before any operation. Chloroform anæsthesia usually greatly facilitates the latter, and is rarely counter-indicated.

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Cf. also the large Text Books, published in the previous, and at the commencement of this, century.

1. *The Induction of Labour before the Full Term of Gestation.*

a. *The Induction of Premature Labour.*

§ 876. By the induction of premature labour is meant the excitation of labour pains before the normal termination of gestation, and more especially at a period of the latter at which the fœtus can continue to live outside the uterus.

The object of the operation is to preserve the mother, or the child, or both, in those cases in which they run great risk, if pregnancy continues, and particularly if it reaches the full term.

It will therefore be obvious that premature labour must never be induced before the 28th or 29th week of gestation; indeed, since the vitality of the fœtus increases with every week, no interference is allowable, until imperatively required. As a general rule, where it is a question of operating very early, the practitioner will do well, when estimating the period of the pregnancy (cf. §§ 131—133), to allow a certain margin for error, and to act, as if pregnancy had lasted 1—2 weeks less than it appears to have done.

The principle on which this operation is based, is such a natural one as scarcely to need any justification. Nevertheless we shall not be surprised to learn that its intentional execution only belongs to a comparatively recent period,—in spite of the fact that nature herself often chose this course with the best possible results,—if we bear in mind that scientific midwifery only dates from the beginning of the last century. Doubtless also it was merely the reaction against the addiction of English obstetricians to those modes of delivery which sacrifice the fœtus, that caused this operation to originate in England, and that assisted to its being first of all generally accepted in that country. The operation was acknowledged to be a legitimate one at a consultation of the leading physicians of London in the year 1756, and in the same year was performed by Macadamy, this, the first case, being successful. But a long time elapsed before the operation was accepted on the Continent; Wenzel, a pupil of Weidmann, was the first to perform it in 1804, and his paper on the subject, which appeared in 1818, together with Foerlep's commendation (in the introduction to the 6th Edition of his then very popular *Handbuch der Geburtshilfe*), led to its adoption in Germany. France, on the other hand, could not so soon make up her mind to adopt a method which had originated in England; at last however, in 1834 the excellent accoucheur Stoltz of Strasburg performed it with success, after having allowed his pupil Burekhardt a year before in an essay (cf. *sub Literature*) to explain its advantages to his fellow-countrymen. Lastly, German midwifery has the honour of having perfected the *technique* of the operation, and of having defined its indications.

§ 877. The *indications* for the induction of premature labour may be gathered from the object of the operation, as stated above. The operation is either a *prophylactic measure*, or else a *rapid means of rescue from danger*. It is prophylactic, where there is mechanical disproportion, and in some cases of habitual death of the fœtus; it is a means of rapid rescue, where the mother is suffering from disease, which either originated during her pregnancy, or became seriously aggravated in consequence of the latter, and which is likely either to disappear, if pregnancy is arrested, or at any rate to lose its dangerous character.

§ 878. Amongst the indications referred to above, the first is of most importance, while of course *pelvic contraction* constitutes the principal form of mechanical disproportion. I have already (*cf.* § 539) laid down the broad principles, on which the induction of premature labour for pelvic contraction is based. I may therefore proceed to point out that the operation is by no means so trivial a matter, as might be supposed from its easy performance; it is far from trivial for the mother, and is still less so for the fœtus. As regards the former, the principal danger arises from the risk of puerperal infection, a risk which is by no means inconsiderable, even if the operation is carried out in the gentlest manner possible, when compared to the risk that is associated with spontaneous delivery; the reason is that the artificially induced labour not uncommonly progresses very slowly. The fœtus is mainly endangered owing to its prematurity, and it will of course run more risk, the younger it is. A further explanation may be found in the fact that operative interference during the course of labour is more frequently required than it would otherwise be, partly owing to the large proportion of abnormal presentations and attitudes, partly owing to the frequently anomalous labour pains. Another important cause for the want of success arises from the by no means small difficulty of hitting the right moment for the operation. If too early a period is selected, there will be but little prospect of preserving the feeble, immature child; if too late, both mother and child will be exposed to the dangers of a difficult delivery in spite of the operation.

If therefore the object in view, viz. that of avoiding a difficult labour and of rescuing both endangered individuals, is to be attained, the following conditions must be satisfied. (1) The operation must not be performed too soon. (2) Every possible

care must be taken to guard against puerperal infection. (3) The degree and form of pelvic contraction, and (4) the degree of development of the child, or of its head, or (what is approximately the same) the period of the pregnancy, must be accurately known.

In regard to the second of the above-mentioned requirements, I shall say more, when describing the various methods of procedure. The first requirement depends on the extreme limit of pelvic contraction, at which the induction of premature labour is admissible. Now a child of 28—29 weeks, that has just become viable, has on an average so large a skull that this can no longer pass, without considerable compression, through a pelvis with a less conjugata vera than 7 cm. (2·75 in.), while, further, such pressure is even more dangerous to a premature than to a mature fetus. Hence it follows that *pelvic contraction with a conjugate of 7 cm. is to be regarded as the extreme limit for the operation.* In the case of the *generally contracted pelvis*, on the other hand, this limit must be raised, since there is here no such possibility of adaptation, as exists with a simple flat pelvis; consequently the pressure, to which the head is subjected, must in the former case be much greater than in the latter, although the conjugate is not any more contracted. *In a generally contracted pelvis therefore the operation should not be performed, if the conjugata vera measures less than 7·5—8 cm. (3—3·2 in.).*

To repeat, *if in an ordinary flat pelvis the conjugata vera only measures 7—8 cm. (2·75—3·2 in.), or if in a generally contracted pelvis the conjugata vera only measures between 7·5 and 9 cm. (3—3·5 in.), the prospects of a full term labour ending favourably for both mother and child, are so highly problematical, that, broadly speaking, the induction of premature labour will under such circumstances always be called for.*

§ 879. Of course the above remarks do not apply to the slighter degrees of contraction. To operate in any case, simply because the pelvis happened to be contracted, would amount to exposing the mother and still more the child to a considerable risk, and this with a view to avoiding dangers, whose existence even is by no means certain, and which as a matter of fact only present themselves under very unfavourable conditions (cf. § 539). *The artificial induction of premature labour under such circumstances is only admissible or imperative, where the shape of the pelvis*

and the bulk of the fetus enable us to prophesy, with tolerable certainty, that the full term labour will be difficult. No great reliance can be placed on the previous history of the woman, i.e. on the termination of former labours, for such termination is by no means of so much assistance as is frequently supposed. I have more than once seen women delivered comparatively easily and safely at the full term¹, in whom, on account of previous labours having been difficult, the induction of premature labour had been determined on, but who came into the Maternity too late for the operation. Much more reliance can be placed on the sequelæ of former deliveries, and on remains of pelvic inflammation. Where these are present, fresh bruising is doubly dangerous, so that such remains of puerperal inflammation may unquestionably call for premature labour in a subsequent pregnancy. If however our information in regard to previous labours does not allow of our deciding that sufficient indication exists, *there is no reason for treating primiparæ differently from multiparæ*. If they present pelvic and fœtal conditions such as in multiparæ would necessitate the operation, they must not be denied the advantages of the latter.

The main problem in settling the indication consists therefore in an exact diagnosis of the degree and variety of pelvic contraction, as well as in that of the bulk of the child, especially of its head. The first point is easy to make out (*cf.* the section on Pelvimetry, §§ 476 *et seq.*), if only it is borne in mind that under these circumstances the determination of the diameter of the pelvis, to within a few mm. more or less, is less important than to determine its general form and capaciousness. It is much more difficult to discover the size of the child; first, because our means of determining the period of pregnancy are very uncertain, and because (even if this were not so) all children do not present an equal bulk at the same period; secondly, because the exact measurement of the fetus *in utero* is a still unsolved problem. How it is to be attempted, has been explained in § 530, and I may refer to that paragraph, so as to avoid repetition.

§ 880. When the operation has been decided upon, the time

¹ This view, which has already been expressed in § 529 and before. in regard to the value of the previous history, appears to me to be somewhat exaggerated. Although the course of earlier labours is not always conclusive, yet great weight should be placed on such, and, generally speaking, it is well after a difficult delivery to consider the advisability of artificially inducing premature labour, should occasion arise. (W.)

for its performance has still to be fixed. In this matter the practitioner must on no account go by rule of thumb, his decision must not depend on our hitherto very unsatisfactory information of the average size of the foetal head or its transverse diameters in the various months, or even weeks, of the last trimestrium of pregnancy; he must not argue that with such and such a degree of pelvic contraction premature labour must be induced at such and such a period, because the great transverse diameter of the head will then measure so much. Such a practice leads to lamentable mistakes and failures. We cannot confidently determine either the size of the pelvis to the exactness of mm., nor the duration of pregnancy in regard to a definite week; and even if we could, the foetus would probably upset our calculation, since, as we know, foetuses of the same age may have heads of different sizes. Nothing but the most accurate and repeated investigation and critical estimation of the relations in any individual case can decide the question. As a general rule it is well to delay as long as possible, since the vitality of the child increases with every week. On the other hand, it must not be forgotten that with every week the dangers for the foetus as well as for the mother may possibly grow. The best plan is to operate between the 30th and the 32nd weeks in the severer cases of contraction, and with the less severe between the 33rd and the 36th, and even later. The settlement of this question is a most difficult and yet important problem for the accoucheur, since a single error may cause complete failure.

§ 881. The *second* indication includes cases in which the artificial induction of labour is solely practised in the interests of the child, and applies where the *habitual death* of the latter occurs during the last weeks of pregnancy, *i.e.* to those cases in which such death has occurred in *all* the previous pregnancies of the same woman. But it will only be possible to preserve the foetus by inducing labour before this date: (1) When its death always occurs at approximately the same time; since, where it occurs at different periods, the moment for the operation cannot be confidently settled. (2) When the existence of organic disease in the foetus (especially syphilis) can be excluded, in other words when the necropsy of the foetuses, that have previously been born dead, has shown them to have a healthy constitution, and when therefore it may be assumed that the foetus is healthy

in the existing pregnancy also. Now these two conditions are extremely rarely met with, a fact that explains how it is that medical literature records so few instances, in which premature labour, when induced on account of this indication, has been crowned with success. As already stated in § 395, the operation is therefore only admissible, when there is reason for attributing the cause of the late intra-uterine death purely to a bad state of nutrition, to anæmia of the mother, which gradually also led to inanition of the fœtus; further, possibly in uterine affections, which are only injurious to the fœtus during the last period of pregnancy, and perhaps with certain anomalies of the cord which slowly kill the fœtus. Owing however to the obscurity by which these ætiological factors are still surrounded, the treatment must depend very much on the judgment of the medical attendant, and good fortune plays still too large a share to allow us to lay down definite indications. A successful case must always be regarded as a rare exception¹.

§ 882. The *third* indication is the clearest of all. *If disease threatens the life of the mother* and resists every other remedy, the artificial induction of premature labour is (like Cæsarian section, where delivery *per vias naturales* is totally impracticable) the only available conservative treatment for the mother, and sometimes also for the child, which shares the mother's risk. Since however the operation under such circumstances is performed with a view of saving the mother, it is of course called for, where the fœtus is dead, as much as at any other time. But it is only demanded, where there is actual danger to life, which danger can be got rid of by interrupting pregnancy; it is not any troublesome condition, that happens to exist during the last trimestrium of pregnancy, that justifies interference. It may often be very difficult in the cases in point to settle the necessity for the operation, and in particular to decide whether it will be beneficial to the mother; nothing but an extensive experience in such anomalous cases will prevent error. In regard to other matters connected with this indication, I may refer to what has been said under Pathology of Pregnancy and Labour, in §§ 246, 251, 253, 263 and 671.

To these three indications Stehberger has added a fourth, viz.

¹ Cf. also Ruge, *Zeitschrift f. Geburtsh. und Gynäkologie*, i, 1877, pp 100—103, and Leopold, *Archiv f. Gynäkologie*, vol. xiv., 1879, p. 313.

the preservation of a viable child, where the mother is hopelessly diseased, and when her death is anticipated before the spontaneous advent of labour, the object being to avoid the performance of Caesarian section *post-mortem*, which is usually hopeless for the child. I, like Pfannkuch (*Archiv f. Gyn.*, vii., p. 173) and Leopold (*ibidem*, xiv., p. 299), have (*cf. supra* § 270) expressed my concurrence in the justifiability of this operation.

§ 883. I have already (§ 878) stated the chief points affecting the *prognosis* of the operation. It must on the whole be regarded as favourable for the *mother*, since she merely runs some risk of puerperal infection, and this we now know how to prevent¹. Nevertheless that danger, as would be expected from the nature of the operation, is somewhat greater than with natural labour, and indeed, even in the best hands, the mortality appears still to be high enough to forbid the operation being performed, except in case of real necessity.

In regard to the *child* the prospects of life, although better than with a full term labour, are by no means favourable. A great number of fetuses die during delivery, and a still larger number perish within the first weeks of life. The reason is that they are premature children, and as such are much more delicate than mature ones. Their cranial bones are less able to bear pressure, their blood-vessels are more lacerable, and these fetuses cannot tolerate intra-cranial effusions of blood as well as mature ones can. Again, abnormal presentations, attitudes and positions are, as we know, much commoner in premature than in full time labours; and still more common with premature labour through a contracted pelvis; commoner also with an artificial than with a spontaneous premature labour, probably because in the case of the latter, owing to a more gradual and slow preparation for delivery, the child enters the pelvis more naturally, and adapts itself better to it. These facts added to the further ones, that even with an artificially induced premature labour there is not infrequently considerable

¹ Hence it is that the mortality in lying-in hospitals has hitherto been very high, the risk of infection being particularly great in such institutions, specially those in which midwifery is taught. The unfavourable results, which I have published in a former paper (*l. c. sub Literature*), were taken from lying-in hospitals, but doubtless these institutions will improve in time. Out of the 26 pregnant women in whom I have since induced premature labour, I have only lost one, and she died of puerperal infection.

difficulty in delivery, owing to errors of calculation, that there is severe pressure on the skull, and that operative interference is necessary, explain why children delivered by premature labour through a contracted pelvis more frequently perish than with premature labour through a wide one, and more frequently with an artificially induced than with a spontaneous premature labour, where the pelvis is contracted; and this is true both during, and after, delivery¹. The operation therefore is mainly practised in the interests of the mother.

Operation.

§ 884. No special preparations are necessary, least of all with the methods which are now in use. If however there is plenty of time, the woman may take a warm bath for several days, before the operation is begun. Her diet too should be attended to, and the bowels encouraged to act freely. When possible, the operation may, for reasons that have more than once been referred to, be begun at the time at which, were the woman not pregnant, menstruation would have appeared.

There are many ways of prematurely inducing "pains". The following *methods* are recommended, and I have arranged them roughly according to their mode of operation :

1. *Excitation of the uterus by pharmaceutical means*—by *ergot* (Bongiovanni² and Ramsbotham), by *quinine* (Sayre)³, or by *pilocarpin* (Massmann, *l. c.*).

2. *Direct excitation of the uterus :*

a. by friction applied to its fundus (d'Outrepoint⁴).

b. by means of the electric current (Herder⁵, Schreiber⁶, Grünewaldt⁷).

c. by a vaginal douche of carbonic acid (Scanzoni⁸).

¹ Out of 26 children, 16 died during, or soon after, delivery. 2 after 7 and 8 days respectively, 2 after 5 weeks; altogether therefore 20, i.e. 77 p. c. Out of the 6 remaining ones, only 4 were known to be living at a later period.

² Kleinert's *Repertorium*, 1828.

³ *American Practitioner*, 1871.

⁴ *Abhandlungen und Beiträge Geburtsh. Inhaltes*, i., 1822.

⁵ *Beiträge z. Erweiterung d. Geburtshilfe*, Dresden, 1803.

⁶ *Neue Zeitschrift f. Geburtshunde*, xiv.

⁷ *Archiv f. Gynäkologie*, vii.

⁸ *Wiener Med. Wochenschrift*, 866.

3. *Reflex excitation of the uterus:*

a. by baths (Gardien¹).

b. by means of the breasts (Friedrichs², and Scauzoni³).

c. by plugging the vagina (Schöller⁴).

d. by warm vaginal douches (Kiwisch⁵).

e. by dilating the cervix with sponge tents (Brünnighaus⁶ and Kluge⁷); with india-rubber bags (Barnes⁸, Schnakenberg [sphenosiphon⁹]; or with metallic dilators (Busch).

f. by irritating the inner surface of the uterine cavity through introducing an elastic catheter or bougie, which is either forthwith removed (Mampe¹⁰, Lehmann) or left *in situ* (Krause¹¹); through an injection between the uterus and membranes (Schweighäuser¹² and Cohen¹³); or through dilating the lower segment of the uterus with an intra-uterine dilator (Tarnier¹⁴).

4. *Separation of the membranes from the lower segment of the uterus* (Hamilton, 1812¹⁵, Rieke).

5. *Puncture of the membranes.* This is the oldest method of all, and may either be carried out according to the plan of Schœl (1799), or that of Hopkins¹⁶ and Meissner¹⁷.

Out of all these methods,—of which those mentioned under 3 and 4 act simultaneously in various ways, partly by irritating the uterus, partly by detaching the ovum,—it is only the vaginal tampon, the vaginal douche, the dilatation of the cervix with sponge tents, the catheterisation and injection of the uterus, Tarnier's method, and the puncture of the membranes, that have been at all widely adopted. The methods mentioned under

¹ *Traité des Accouchements*, 1816 and 1822.

² *Dissertation de nova quadam partus prematuri celerandi methodo*, Rostock, 1839.

³ *Verhandlungen Würzb. Phys.-Med. Gesellschaft*, iv., 1853.

⁴ *Die künstliche Frühgeburt bewirkt durch den Tampon*, Berlin, 1842.

⁵ *Beiträge z. Geburt.*, Würzburg, 1846.

⁶ *Neue Zeitschrift f. Geburtakunde*, iii., 1820.

⁷ *Mendel's Beobachtungen u. Bemerkungen*, iii., 1826.

⁸ *Vide infra*.

⁹ The sphenosiphon is a syringe used for inducing premature labour. Cf. Siebold's *Journal*, vol. xiii.

¹⁰ *Casper's Wochenschrift*, 1838.

¹¹ *h. c.*

¹² *Das Geboren nach der beobachteten Natur*, Strasburg, 1825.

¹³ *Neue Zeitschrift f. Geburtakunde*, xxi., 1846.

¹⁴ *Gazette des Hôpitaux*, N. v., 1862.

¹⁵ *Thompson, London Medical Repository*, 1820.

¹⁶ *Accoucheur's Vade-mecum*, London, 1826.

¹⁷ *Heidelberg. Med. Annalen*, vi., 1849.

(1) and (2), with the exception perhaps of pilocarpin, are quite obsolete. Even pilocarpin has been almost entirely abandoned, for it usually fails in the object of exciting "pains" (*cf.* § 458).

A good method must act certainly and gently. The labour that follows upon it, must, as nearly as possible, resemble spontaneous delivery, and it must afford as little opportunity as possible for infection. I will briefly review these methods from this stand-point.

§ 885. *Plugging of the vagina* used to be done with lint, afterwards with an animal's bladder (Hüter); of late a caoutchouc bag, called the colpeurynter (Braun), has been substituted. The method acts slowly, and is very painful and unpleasant; it obliges the woman to lie down continuously, interferes with micturition and defecation, is apt to cause endocolpitis, and may lead to septic infection. I can only recommend its selection in the exceptional cases, in which hæmorrhage exists at the same time and requires to be checked; it is mainly therefore on account of such hæmorrhage that this method is adopted.

The use of *warm vaginal douches* (called *warm ascending uterine douches*) is a mild proceeding, and free from danger, when properly carried out. On the other hand this method also acts somewhat slowly, and sometimes is totally inoperative. The latter characteristic applies especially to the case of primiparæ, in whom the cervical canal is closed. Injurious after-effects have scarcely ever been observed, if we except some rare instances in which slight hæmorrhage has resulted from disturbance of the lower segment of the uterus. But for the operation to be successful, the water must be very warm¹ (40° — 44° C. = 104° — 111° F.), and must pass in with a certain force, and in a continuous stream; moreover it must be directed vertically against the vaginal fundus, and the irrigation be repeated sufficiently often. Consequently the vessel containing the water must neither be too small nor too low to prevent a good stream being obtained;

¹ Runge ("Die Wirkung hoher und niedriger Temperaturen auf den Uterus des Kaninchen und des Menschen," *Archiv f. Gynækologie*, vol. xiii., p. 123) recommends hot douches of 50° C. = 122° F. for this purpose; so also do Wächter ("Ein Fall v. künstlicher Frühgeburt, eingeleitet vermittelt d. heissen Douche," *Württemberg. Medic. Correspondenz-Blatt*, 1879, No. 11) and Weiss ("Ueber heisse Douchen und Pilocarp. Mariat. als Mittel zur Einleitung d. künstlichen Frühgeburt," *Inaugural Dissertation*, Berlin, 1880). But the *Verhandlungen der Gesellschaft f. Geburtshilfe und Gynækologie in Berlin*, July 8, 1879 (*Berliner Klinische Wochenschrift*, 1879, No. 52) show that even hot douches are not always reliable.

and the vaginal tube should only possess one orifice (and that not very small) at its apex, since many openings diminish the force of the current. Syringes are quite unsuited to these cases, for the reason, if for no other, that air is liable to be forced into the cervix and uterine cavity, an accident which has actually occurred with very lamentable results (*cf.* §§ 778, 780), but which it is always easy to avoid with irrigations. Since however water might possibly penetrate into the uterine cavity, even with simple irrigations (an occurrence which should be avoided, except where it is intended to increase the efficacy of the douche, for it might lead to partial detachment of the placenta), an intelligent person should direct the tube against the vaginal fundus and not against the os, lest this happen to be patulous. It is a good plan to begin by irrigating three times a day, for about five minutes at a time. The frequency and duration may then be increased, according to the effect and the urgency of the case. After each douche the pregnant woman should rest for a while; but during the intervals she may walk about as long as the pains permit.

The douche acts by the warmth of the water, by irritating the lower segment of the uterus, and by distending and stretching the fundus vaginæ (if an examination is made during the irrigation, the latter will be found expanded like a bladder). This is the least risky method, and is least likely to give rise to septic infection. Moreover, although often slow, it will in the majority of cases attain the desired object, especially as, by increasing the frequency and duration of the irrigations, and by allowing water to penetrate into the uterine cavity, the accoucheur can at will increase the effect. And supposing that labour is found to advance too slowly, everything will have been done that can, to prepare the way for more energetic measures.

The *dilatation of the cervix with sponge tents*, which may be preceded by laminaria tents, where the cervix is very narrow, soon provokes pains. But not uncommonly the effect is only transitory, even if thicker sponges are by degrees resorted to. Further, their insertion is not always easy, and when repeated, always causes more or less injury, while there is a by no means slight risk of infection being provoked by decomposing sponge. Again, the pregnant woman is obliged to lie down continuously. For these reasons I cannot on the whole recommend the method;

it should be reserved for cases where the operation of the douche is too slow, and where a more powerful mechanical irritation of the uterus is desired¹.

The method of dilating by hour-glass-shaped india-rubber bags, of which one portion lies in the cervix, the other in the vagina, and which can then be distended by means of a syringe (Barnes, Keiller), can only be used, where the cervix is already comparatively wide. It is therefore not suited for provoking "pains", but at best for intensifying them, when already present.

§ 886. The catheterisation of the uterus, as recommended by Krause, is a sure and rapid method. But it involves the great risk of introducing air into the uterine cavity, *i.e.* of septic infection, and this risk remains, even when a solid bougie is substituted for the catheter, for air enters with, and by the side of, the instrument. To this must be added the difficulty of introducing the latter, where the os is closed, and the always unpleasant chance of reaching the placenta with the instrument, and of tearing the membranes. The catheterisation² therefore should only be employed as an accelerative measure, much as with spontaneous delivery (*cf.* § 455).

All the considerations, that have been urged against the last-mentioned mode of inducing premature labour, also hold good in regard to the use of *intra-uterine injections* as recommended by Cohen, while in addition there is a much greater risk of air entering and of the placenta being detached. I therefore regard this method as one that should be rejected.

Tarnier's plan³ consists in dilating the lower segment of the uterus by a small, thin, india-rubber bag, ending in a long thin tube, which bag is pushed above the internal os, and then dis-

¹ Laminaria or tupelo (not sponge) tents should be used, since they are accompanied by less risk of infection. Several such tents may be introduced side by side, in proportion to the effect which it is desired to produce.

² The danger of catheterising the uterus does not appear to me to be as great as is stated in § 455 and above, whether we regard the risk of infection, or the possible detachment of a lobe of the placenta. Infection can generally, although perhaps not always, be avoided, if sufficient care is taken. The best way to avoid detaching the placenta is, if the bougie meets with obstruction, when first inserted, to introduce it again in an opposite direction; and this of course must also be done, if hemorrhage follows the introduction. Injury to the membranes is certainly unfortunate, but need not interfere with labour to any serious extent. Where the cervix is closed, dilating measures must precede the catheterisation. Nevertheless Krause's method cannot be reckoned as a mild one. (W.)

³ *Cf.* my communication in *Berliner Klinische Wochenschrift*, 1869, Nos. 9 and 10. Also Storer, "On artificial dilatation of the os and cervix uteri by fluid pressure from above," *Boston Medical and Surgical Journal*, July, 1863.

tended with warm water. The introduction is effected by means of a curved metal rod, which on its convex side is excavated in the form of a groove so as to receive the tube. The stretching of the lower segment of the uterus, and the associated detachment of the membranes act as a strong provocation to "pains"; but the introduction of the bag is inconvenient, and, since the latter sometimes bursts, has often to be repeated. Moreover these repeated intra-uterine measures involve considerable risk of infection, although as a rule this is avoidable. This method therefore should not be used as a primary one, but, like those just mentioned, only with a view of accelerating delayed dilatation, and even then it must be accompanied by the most strict antiseptic precautions.

Instead of Tarnier's complicated apparatus, a catheter covered at its end by a thin india-rubber bag, may be employed. I have frequently effected my purpose by its means, and have avoided rupturing the india-rubber bag by carefully testing its elasticity before introduction.

The same remarks in the main hold good of *puncture of the membranes*. Sooner or later labour must follow on the evacuation of the liquor amnii, and the effect is therefore sure and speedy. In spite of this however the plan cannot be recommended, since labour here starts with the discharge of the amniotic fluid, *i.e.* with the occurrence which should only take place with the completion of canalisation. We thus lose a material aid to the dilatation of the cervix, while moreover the general intra-uterine pressure is as a rule absent from the first. Hence although the onset of labour is rapid, we not rarely get slow progress, very frequent abnormal presentations and positions of the child, a premature interference with the fetal interchange of gases, and puerperal infection. With the exception of those cases in which a rapid diminution in the size of the uterus is called for, and such, strictly speaking, do not belong to the category of cases that require this operation, the puncture of the membranes cannot be recommended as a method for provoking labour¹, but only, as in the case of spontaneous labour,

¹ The results which have been attained by this method in the No. I. *Clinique* at Vienna (cf. the paper by Rokitsansky, *jun.* *Wiener Medicinische Presse*, 1871, Nos. 30—34, and the recent one by Hegetschweiler, "Die künstliche Frühgeburt mit besonderer Berücksichtigung ihrer Einleitung durch den Eihautsich," *Inaugural Dissertation*, Erlangen, 1879), cannot invalidate either an experience extending over a long period, or theoretical considerations.

as an occasional means of accelerating a labour which has already started.

The puncture of the bag of membranes may be performed with a sound or a catheter, in the way described in §§ 456 and 654. In order to prevent all the liquor amnii from escaping at once, to retain a portion of it and to allow the bag of membranes to "present," Hopkins and Meissner have suggested that a portion of the membranes lying high above the os be punctured. This however cannot be done with ease or safety.

§ 887. The above description will show that *the requirements demanded of a good method—a gentle and reliable action, ease and convenience of performance, and a freedom from danger for mother and fœtus—are not, strictly speaking, presented by any method, even by that of Kiwisch.* Nevertheless, owing to its gentle action and the absence of risk, I can only recommend this one as a means of starting the labour. If the latter then advances more slowly than is desirable, the "contractions" may be strengthened by catheterisation of the uterine cavity or by Tarnier's bags; and, if necessary, labour may be accelerated by rupturing the membranes. The latter procedure is only called for at an earlier period, where it is important immediately to empty or to diminish the size of the uterus. Where the cervical canal is closed, tents are the best means to begin with, in company with the douche.

The management of a labour, which has been artificially induced, differs in no respects from that suited to a spontaneous case. But it is especially important during its progress to cleanse the vagina by disinfectant irrigations. Special care moreover must, for reasons already stated, be taken of the child, if, after being born alive, it is to be kept so.

b. Artificial Abortion.

§ 888. By artificial abortion is meant the induction of labour at so early a period of pregnancy, that the fœtus cannot continue to live outside the uterine cavity.

The object of the proceeding is to rescue the mother, in cases where she cannot be saved, if pregnancy is allowed to continue, or where there is the greatest probability that she will be lost.

The indications follow naturally. The first is presented by those morbid conditions whose nature and progress convince us that the mother, and of course the fœtus also,

perish, unless pregnancy be interrupted. Under such circumstances therefore we are bound to try to rescue at least the mother. On the other hand such a condition (viz. one in which, apart from abortion, the state of the mother is hopeless, and in which with the operation there is a probability, or at least a possibility, of rescuing her) must necessarily be present; otherwise we adopt a line of conduct which would disgrace our profession. The remarks made in an earlier chapter in regard to various diseases, show that there are but few conditions that demand the induction of abortion, except some forms of uncontrollable vomiting, and otherwise irremediable impaction of the retroflexed or prolapsed uterus, and apart from the disorders referred to in §§ 246, 251, 253, viz. progressive, pernicious anemia, severe nephritis and chorea. Extra-uterine pregnancy however (§ 334), where the diagnosis has been made early, or when the presence of such abnormality has even become probable, may require the destruction of the ovum by puncture of its sac.

The second indication is furnished by some cases, in which delivery at the full term is absolutely impossible (§ 506). Thus particularly when Cæsarian section cannot be expected to save the mother, as happens where the dystocia is due to subserous retro-cervical, and especially to retro-vaginal, myomata (*cf.* § 596). When delivery *per vias naturales* is absolutely hopeless, owing to other causes (especially when due to pelvic contraction), abortion is only admissible, when here also there is reason to think that, owing to special circumstances, the gravid woman will not survive Cæsarian section, or when she at an early period declares that she will not subsequently submit to such operation. For if we grant that she has the right at the end of pregnancy of declining to run a great risk of life in the interest of the child, as is the case with relative indication for Cæsarian section, we must also admit that she has the same right at the commencement of pregnancy. In any individual case there are many other factors, based on the social and family relationships of the pregnant woman, that have to be considered, and that will assist the practitioner in arriving at a decision.

§ 889. It must moreover be borne in mind that the sequelæ of artificial abortion are, generally speaking, more serious than those of spontaneous abortion, and that, especially where it is disease that furnishes the indication, those sequelæ are very apt

to aggravate that disease, and thus to accelerate an unfavourable issue. The operation should never be performed, without its advisability having been confirmed by consultation with one or more colleagues. The practitioner owes this to himself as well as to his patient.

The time for the operation is usually fixed by the urgency of the symptoms that call for it. With pelvic contraction and similar conditions, the 3rd—4th month should be chosen, since the diagnosis of pregnancy can then almost always be made with approximate certainty, while the performance of the operation is easier, the progress of abortion, and especially the expulsion of the secundines takes place more smoothly than at an earlier date.

The means of inducing abortion are the same as those for premature labour. As a rule it will be best to provoke such abortion, by douches or tents (laminaria or tupelo), by catheterisation, or by repeatedly passing a sound into the uterine cavity, and, if there is delay, to terminate it by perforating the membranes. It is not a good plan to begin by puncturing the latter, since, when that is done, portions of the secundines are apt to remain behind. I have already mentioned that in cases of retroflexion it may be necessary to puncture the uterine cavity *per rectum* (§ 294).

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2. Version.

§ 890. *By version is meant the operation of artificially altering the fetal presentation, i.e. the removal of the presenting part from the brim of the pelvis and the bringing down upon, or into, the latter of another part, which is always one of the longitudinal poles of the fœtus.*

Version is performed (1) in order to rectify a faulty presentation or an abnormal attitude, so that spontaneous or, when necessary, artificial delivery may become possible; (2) in order to convert a presentation (cephalic), which in itself is natural, into another which is more suited for the operation that is to follow, i.e. into the podalic presentation.

In both cases version is only a preparatory measure, intended to improve the presentation of the fœtus. With an abnormal presentation, the improvement is absolute, with cephalic presentations it is relative, since the extraction, which is necessitated by the circumstances of the case, can only be performed by the pelvic extremity. In cases therefore where the one object is to rectify the faulty presentation, this object will practically have been attained, as soon as the longitudinal presentation has been brought about, and further interference only becomes necessary, where special indications exist; in the second category, on the other hand, version is merely the first act of extraction.

It is only in the case of a transverse presentation that any question can arise, as to which end of the fœtus should be brought down into the pelvis. The existing conditions must determine whether the head or the feet, and sometimes also the breech, are to be selected, and hence we speak of cephalic¹, pelvic and podalic version.

Cephalic version is the oldest method. As early as the time of Hippocrates, and afterwards too, it was believed that the cephalic presentation was the only one in which the child could be born, and this belief caused attempts to be

¹ Strictly speaking, *cranial* would be a better term, since no one would dream of bringing down the face or the forehead.

made to bring about a head presentation, whenever any other form existed, including of course pelvic presentations. It is true that Aristotle and Celsus knew better, but their knowledge was afterwards again lost. Paré in 1559 (*Ed. Malgaigne*, vol. ii., p. 628) was the first, in whose hands podalic version assumed its proper place. Next came P. Franko (1561), and especially Guillemeau, a pupil of Paré's; still later, the younger Mauriceau and de la Motte, who greatly developed the mode of procedure. Cephalic version, with few exceptions (*e.g.* Smellie, *Treatise of Midwifery*, edited by the New Sydenham Society, 1876, vol. i., p. 341), was entirely forgotten, until at the beginning of this century it was once again brought into notice by Flamant in Strasburg and by Oslander. Wigand, amongst other obstetricians, defined the conditions under which it should be performed.

Since cephalic and pelvic (breech) version is only suited for certain cases, and we are here mainly dealing with the *technique*, I shall consider the operation in the various ways in which it can be practised; and deal with the several methods in the order in which they are mildest, although, especially in difficult cases, the mildest are also the least reliable. These methods are:

Version by posture and external manipulations;

Version by a combination of external and internal manipulations;

Version by internal manipulations alone.

But in accordance with what precedes, we must start by more exactly defining the circumstances under which podalic or pelvic version is indicated and admissible.

§ 891. There can be no question that

Cephalic Version

is the most rational proceeding, where our sole object is to rectify a faulty presentation. Indeed this conclusion follows naturally from the circumstance that the enormous majority of labours end as cephalic presentations, and end most favourably so. This fact has led some obstetricians to recommend and carry out the operation in *pelvic presentations*¹, and they were justified in doing so, especially when success crowned their proceeding (*cf.* § 188). But the success of version depends on so many contingencies, that the practical result is very greatly affected by them. These contingencies are first of all an *absence of any complication, which would demand an acceleration of delivery, or*

¹ *Cf.* especially Hegar, *Deutsche Klinik*, No. 33, 1866.

which might hinder the head from engaging normally in the pelvic brim with the full cranial surface downwards. Hence prolapse of the cord or of an arm for instance, and, above all, pelvic contraction forbids cephalic version. The latter condition does so mainly because the principal element of success, *i.e.* the immediate fixation of the head after it has engaged, is not present, and because this fixation, when it does take place, is apt to occur in a position which is unfavourable for the passage of the head through the contracted region (*cf.* § 537). A second condition is a *certain degree of mobility of the child in utero*, in order that the external manipulations, which are necessary to the operation, may be able to rotate the fœtus. Moreover the abdominal and uterine parietes must not be too sensitive, otherwise those manipulations will be impossible. Cephalic version therefore will be most likely to succeed, where the amniotic fluid has not yet escaped. Even that escape however is not necessarily an obstacle, if only the uterus is not too firmly contracted round the fœtus, and if its transverse diameter has not become too small to admit of some elongation taking place, when it is stretched during version.

All the other conditions, by which it has been proposed to limit cephalic version, are less absolute than those just stated, however desirable their fulfilment might be. Thus in view of the advantages which cephalic version offers to the mother too, it is not absolutely necessary that the child be alive; still less that good pains be present, or that there be reason to anticipate such, when once the head has engaged. As a matter of fact weak contractions facilitate the operation, while the "pains", that are so very desirable after the latter, in order to fix the head, may be replaced by external pressure (*expression*).

We arrive thus at the conditions in which cephalic version should always be practised, and I have already referred to them in §§ 642—644, when discussing transverse presentations. To these conditions must still be added those *cases of transverse presentation in which the liquor amnii has escaped, and the os uteri is still contracted*. For the podalic presentation, which can, as easily as the cephalic presentation, be brought about by the external or by the combined method, is extremely unfavourable to the child under the circumstances, while on the other hand if an expectant treatment is pursued, until the os uteri is fully dilated or

nearly so, the difficulty of subsequent version is greatly increased. Here therefore the production of the cephalic presentation comes in as the most salutary measure, which may rescue many a child, and shield many a mother from danger. Of course success will not always be attained under these circumstances; but it will not be uncommon, if only the attempt is made.

We have not as yet sufficient facts upon which to base a definite conclusion, in reference to the prognosis of cephalic version. The number of observations bearing on the subject is still limited. The general practitioner especially has rarely the opportunity of performing the operation; in the first place because for obvious reasons he does not see the case of transverse presentation sufficiently early; secondly and mainly because in podalic version he has at his disposal a means of bringing the labour to a rapid end, whereas, if he waits for the results of cephalic version, comparatively much time is consumed. *A priori* of course cephalic version should present the best prognosis; although the fact that spontaneous cephalic presentations are followed by the best results, does not prove that the same will hold good, where that presentation has been artificially brought about, and this is especially true in reference to the child.

§ 892.

Pelvic (Breech) Version

(by which of course is meant, not merely the act of bringing into the pelvic brim the pelvic end of the fœtus, which is already presenting but deviates slightly to one side, but true version from a transverse presentation) scarcely deserves to be called a special mode of version. For even if the breech has either by accident or intentionally been brought down into the pelvic inlet, this is nevertheless merely an *entr'acte* in the course of podalic version. Indeed, inasmuch as an incomplete podalic presentation is no worse for mother or child than is a breech presentation, while on the other hand it has the advantage of always affording a handle for the extraction (which may be an extremely difficult and damaging matter to accomplish by means of the breech), there is no object in resting content with pelvic version. If therefore the breech has been brought down by internal or external manipulations, a foot should always be got hold of, and this remark applies, even where pelvic version would seem to be exactly indicated according to what is said above, viz. where it is

impossible to reach the feet. In such a case of course the accoucheur will be very glad to meet with a *point d'appui* at the breech, and to be able to press it down, by hooking one or two fingers over the hips or perineum (Betschler), or even into the anus (Meissner, *Monatsschrift f. Geburt.*, x., p. 347, Guéniot, *Archives de Tocologie*, Nov., 1877); but the limbs must be brought down as soon as possible.

There is only one condition in which pelvic version should be performed, viz. where the trunk is forced deeply and immovably into the pelvis, and where it is a question of avoiding embryotomy. As already mentioned in § 646, it may sometimes be possible under such circumstances, by passing a hook into the inguinal region and thus performing version within the pelvis, to imitate the process of spontaneous evolution, and even to rescue a living child.

a. External Version.

§ 893. The chief points in regard to this method have been stated in § 644. It is mainly employed with a view to bringing about a head presentation, *i.e.* where the conditions are favourable for the performance of that operation. But even when it is not found possible to cause the head to engage, the method should at any rate be tried in regard to the pelvic extremity. In other words as long as there is a chance of success, external version should never remain untried.

Its *technique* consists of external manipulations and suitable posture. In carrying out the manipulations, the accoucheur applies his hands at numerous opposed, oblique or nearly parallel surfaces of the abdomen, and presses them against the two poles of the fetus, head and breech. By this means the fetus is made to move about in the uterus, and may be turned in much the same way that a cylinder may be rotated round its transverse axis. It is very important to begin by rendering mobile that portion (usually the head) of the fetus which lies nearest to the lower segment of the uterus, and to force it downwards; the higher portion will then frequently of its own accord travel on, being encouraged to do so by the other hand. If, on the contrary, the portion which is to be brought down, lies higher than the opposite pole, the exactly opposite manipulations will of course be necessary, until this portion has descended and crossed the

equator of the uterus. If "pains" set in during the manipulations, the latter must be persevered with, until the hardening of the uterine parietes prevents any further influence on its contents; indeed even then whatever progress has been made, must be maintained during the "pains", by the accoucheur fixing the fœtus on either side with his hands. The onset of pains, when once the fœtus has been got into motion, is sometimes a very rapid means of completing the desired movement.

I have already mentioned that I prefer the lateral posture for carrying out this operation; it facilitates the manipulations, and the alteration of posture usually also provokes stronger pains. At all events the lateral posture should be assumed after the operation, since it will be most likely to render the effect of the latter permanent. The woman should always lie on the side that corresponds with the fetal portion that is to be brought down into the brim.

Frequent examinations should be made, while the operation is being carried out, in order in good time to ascertain the result. During the internal exploration a third hand may replace the one that is now exploring, and act, as the accoucheur directs. If now the part of the fœtus that is to be brought down, is felt to be near the os, the manipulations must be vigorously continued, and as soon as it is found to be fully over, or at any rate to cover a great extent of, the brim, the bag of membranes should be ruptured, this being done during a pain (best of all at its commencement), so that the contraction of the uterus may still further depress and fix the pole of the fœtus that has engaged. If the "pain" is too weak for the purpose, it may be supplemented by expression. It is also desirable that only a small opening be made in the membranes, so that the liquor amnii shall not escape too suddenly and all at once. The membranes should only be ruptured during the interval between two contractions, where the cord is felt to be near the os; the uterine contraction must then be replaced by expression, and the entrance of the fetal pole into the pelvis closely watched, so as to keep the umbilical cord from being pressed on. If however the os uteri is insufficiently dilated to allow of the membranes being ruptured, we must be content for the present with placing the woman on her side and fixing the uterus and the fœtus by pillows and a bandage. Under such conditions it is a capital plan to exert a special and

prolonged pressure from without on the portion which has been caused to present.

b. Combined or Bipolar Version.

§ 894. By combined version is meant the method of turning the fœtus by acting on its extremities (poles), both from without and from the lower segment of the uterus. The fœtal cylinder is gradually brought into the longitudinal presentation, by the portion of the fœtus which originally lay over the internal os, and the portions which are successively caused to do so, being pushed aside with the fingers that have been passed into the os, while the other hand of the operator co-operates *ab externo*. This proceeding, or one more or less like it, has at various times been practised in isolated cases (more particularly by d'Outrepont¹, Hohl, Späth, Hecker, and by Wright in Cincinnati²). R. Lee (*Clinical Midwifery*) then showed that it was possible, while the os uteri was still only slightly dilated, through that os to push the head on one side to such an extent as to produce a transverse presentation, and that, when this was done, the knee could easily be reached, since when the fœtus is in the normal attitude the knee lies near to its umbilicus, i.e. not far from the os, less than a finger's length from it. Lastly, Braxton Hicks combined these manœuvres with that of Wigand, and introduced the combined method which bears his name.

This method has an advantage over the external in point of certainty; and over the internal in that it can be practised while the os uteri is only slightly dilated, and sometimes even after the rupture of the membranes, and of course also where dilatation is complete. In the latter case moreover it is much less injurious to the uterus than is the entirely intra-uterine method of version.

This mode of turning is on the whole but little used as yet, partly because it was mainly introduced for cephalic version, and the latter, as already stated, is not very popular; partly because internal podalic version has, whenever possible, been hitherto immediately resorted to, with a view of saving time and on account of its striking results. If on the other hand such

¹ Cf. *Progr. von der Selbstwendung und der Wendung auf den Kopf*. Würzburg, 1817.

² Cf. *American Journal of Obstetrics*, vi., 1878, p. 78.

internal podalic version is not yet possible, the practitioner is generally in no hurry to rectify the presentation of the child, where the bag of membranes is still intact; indeed the early rupture of the membranes which must be produced by the combined podalic version, is usually dreaded, and as a rule rightly so.

Nevertheless the method has a future before it, and it is urgently indicated more particularly in the cases in which rectification is demanded, while the os is but little dilated, and above all when the bag of membranes has already burst. If under such circumstances, where a transverse presentation exists, the dilatation of the os, which is requisite for the performance of complete internal version, is awaited, a condition which is most unfavourable for that operation, will generally have developed. Again, if there is *prolapse of the cord*, the child is extremely imperilled, where the liquor amnii has been discharged, and an early podalic version may possibly save it. This method moreover is to be recommended in cases of *spontaneous rupture of the uterus* (Fritsch, *Klin. geb. Operat.*, p. 159), owing to the risk of the tear being increased, if the whole hand is introduced into the uterus. On the other hand I have already explained in § 441 that this method should not be selected in cases of *placenta prævia*. Under such circumstances the premature rupture of the membranes with the view of bringing down a foot is a mistake, inasmuch as there are gentler means of arresting hæmorrhage, as long as the membranes are still intact. But if the liquor amnii has been discharged and delivery is called for, the latter must be forced, since so much manipulation at the seat of the placenta, as is required for bimanual version, can only do harm. Exceptional cases in which, after the escape of the amniotic fluid, the breech of the fœtus can be used as a tampon, will of course occasionally occur, although the condition of the os does not allow of extraction. The above rules must therefore be regarded as general ones.

On the other hand bimanual version must be adhered to, even where the os is sufficiently dilated to allow of internal version, wherever there is no need to hurry. Its advantages have been mentioned¹.

¹ Quite recently A. Martin (*Leitfaden &c.*, p. 30) has come forward as a special advocate for combined version. He recommends that it be carried out in all cases that are not unduly complicated, even where the os is completely dilated, and that

This operation is not easy. It requires an accurate knowledge of the presentation of the fœtus, and steady delicate hands. But above all a certain, not inconsiderable degree of mobility in the fœtus is necessary, as well as a non-resisting condition of the abdominal and uterine parietes. Chloroform anæsthesia should therefore always be induced, and with its help the operation may not infrequently be completed, even after the rupture of the membranes. The narcosis is further required, owing to the fact that the whole hand must be introduced into the vagina, or else it will not be possible to pass two fingers sufficiently far through the internal os, as to be able to act with certainty on the presenting part of the fœtus; further, the disturbing forcing and bearing down, which occur whenever the hand is in the parturient canal, can only be got rid of by administering chloroform. Where the fœtus is small and non-resistant, especially where it is dead, the procedure is more difficult, but even these conditions do not constitute an absolute obstacle. Excess of liquor amnii is also an impediment, since even when a longitudinal presentation has been produced, this is apt to be unstable; for this reason it may sometimes be a good plan to let off the amniotic fluid at the commencement of the operation.

§ 895. The operation is usually performed, as the woman lies on her back and on her own bed. The accoucheur either sits on the opposite side of the bed to that towards which the presenting part is to be pushed; or else always on the left side, if, as Braxton Hicks suggests, the left hand is invariably chosen for internal manipulations. Neither point is material.

If *cephalic version* is to be performed (in a case of transverse presentation), the internal hand seeks to push the shoulder in the direction of the feet (*e.g.* where the head is on the right side, the shoulder is pushed to the left and upwards), while at the same time the head is pressed down from without, until it has come within reach of the fingers that are lying within the uterine cavity. It will then be under the control of the two hands, which can give it the desired attitude. If the breech does not move up sufficiently, it must be pushed in that direction by

version with the whole hand be restricted to labours that have been greatly neglected. This advice will scarcely be largely followed in general practice, since the performance of the so-called internal version is distinctly easier than that of the combined. (W.)

the hand of a third person, while that of the operator, acting *ab externo*, holds the head firmly over the brim; this is better than withdrawing the internal hand, and with it pushing up the breech. When the head has been caused to present, it must for some time longer be fixed *in situ* by means of external pressure, just as in cases where external version has been performed. For this purpose it will usually be necessary to rupture the membranes.

(2) With *podalic version from a head presentation*, the internal hand pushes the head upwards in the direction of the dorsal surface, while the external one pushes the breech down towards the opposite side of the uterus. The region of the shoulder will now come to lie above the internal os, and this must be pushed by the fingers in the same direction as was the head, the breech being pushed still further down, until the internal fingers touch the knee. If the membranes are still intact, they may now be ruptured; at any rate the knee is to be hooked with the fingers, and drawn into the os. If it is found possible at once to seize the foot instead of the knee, so much the better¹. The external hand, having quitted the region of the breech, will now be at liberty to force up the head; indeed if the latter is unwilling to move upwards, it may not infrequently be necessary to act upon it at an even earlier period, and alternately to push it upwards and the breech downwards. If the position of the fetus is not accurately known, the head, if lying on one side, may be pushed on in the same direction; and if it is central, no great harm results, if the fetus is for once displaced towards its abdominal, instead of towards its dorsal, aspect.

Podalic version is yet more simple with *transverse presentations*. The shoulder is then pushed towards the head, the latter is pushed upwards, and the breech downwards, until one of the lower limbs has been seized by the internal fingers.

The wider the os, the more yielding its edges, the easier will the combined version prove; and where it fails, the internal

¹ If, while being pushed down with the external hand, the breech itself, with the lower limbs extended upwards, comes within reach of the os, instead of the feet doing so, the operator may render the latter accessible by pushing the breech to one side into one or other iliac fossa, or by turning the fetus round its longitudinal axis (by hooking the index finger into one of the groins). Cf. Kaltenbach, "Zur combinirte Wendung auf die Füsse nach Braxton Hicks." *Zeitschrift f. Geburtsh. und Gynäkologie*, vol. iii., 1878, p. 185.

podalic version can usually soon follow. If however the os is still narrow, the case is different; it is then not wise to manipulate within the lower segment of the uterus too long, or too freely. The better plan is to give up the combined method, as soon as it seems not to have a prompt effect.

c. Internal Version.

§ 896. In internal version the portion of the fœtus, which is to be brought down into the brim of the pelvis, is directly seized by the hand of the accoucheur, which has been wholly introduced into the uterine cavity for this purpose. The longitudinal axis of the child is then brought into correspondence with that of the uterus, by means of traction on the part that has been seized. This mode of version is therefore a purely intra-uterine operation, although of course the free hand, as with all other intra-uterine operations, must co-operate as far as it can from without. Moreover it is only applicable, where the os uteri is either fully dilated, or at any rate is so yielding, that it presents no great resistance to the introduction of the hand.

§ 897.

Cephalic Version

is probably rarely performed in this way, since the success of the operation is so very uncertain in comparison with the concomitant risk. Two modes of procedure however offer themselves. According to the first, which is recommended by Busch (*direct version*), the parturient woman lies on her back, while the hand which corresponds to the side on which the head lies, is passed so far through the os that the fingers rest on the occiput, and that their tips reach the nape. The membranes, if hitherto intact, are now to be ruptured, after which the head is drawn into the brim with the fingers, the thumb meanwhile holding or pushing back any small parts that may have become prolapsed. According to the second method, that of d'Outrepont (*indirect version*), the hand, which is opposed to the side on which the head lies, is introduced into the uterus, and the membranes are opened. The presenting shoulder is now grasped with the fork between the thumb and other fingers, and pushed upwards and towards the breech. A longitudinal presentation is thus brought about, while the head descends into the brim of the pelvis. A

a last step, the receding hand seeks to give the head a favourable position, and to fix it there.

Without co-operation from without however, Busch's method will not succeed, since the drawing down of the head is not identical with bringing the foetal axis into the longitudinal axis of the uterus. Indeed the latter is difficult to accomplish in the case of the head, on account of the loose connection between head and trunk, and because the fingers, while being withdrawn, cannot assist in fixing the head. The other method, it is true, strikes at the root of the difficulty, inasmuch as it endeavours first of all to bring about a longitudinal presentation, and thus indirectly causes the head to present. But, on the other hand, the operating arm, which lies in the brim of the pelvis, prevents the head from engaging, while the trunk is being pushed up, so that unless such external help is given as will maintain the longitudinal presentation, the head will glide aside on the withdrawal of the hand, and the shoulder again descend. It is clear then that internal cephalic version will not be successful, unless external manipulations, similar to those used in the external mode of version, accompany it. Now this fact is an argument why cephalic version should only be practised by means of such external manipulations or else by the combined method, since as a rule the latter suffices. Wherever internal version is required, the podalic method should be selected.

§ 898.

Podalic Version

is therefore the true internal operation, and is the most important method. It will remain so too, for its province is very large, and its results are very brilliant. When combined with extraction, it is the crowning obstetrical operation.

The *indications* have been broadly sketched in § 890. The operation is undertaken, wherever cephalic version is inadmissible or has failed, and where the method of combined podalic version is impracticable. Thus it is used (1) with transverse presentations, where the last-named conditions hold good. (2) With head presentations, where the position or attitude of the fetus is so unfavourable that the further progress of delivery, if the head presentation is allowed to continue, appears certain to be more dangerous both to mother and child than delivery with a footling presentation. To this place moreover belong the indications arising out of certain positions of the cranium, face and brow,

out of prolapse of the limbs and cord, and also out of pelvic contraction (§§ 534—535). (3) As a preliminary to extraction, with all complications which demand the speedy termination of delivery, and when this cannot be accomplished in any gentler way by acting on the presenting part.

The *conditions* of version are:—

1. The os uteri must be so dilated or its edges at any rate must be so distensible, as to allow the operating hand to pass in, without rupturing and without rapidly paralysing the hand, and to allow the subsequent exit of the child.

2. The pelvis must not be contracted to such an extent that the after-coming head is unable to enter the brim. As a rule however it is not well to perform version, where it is certain that the after-coming head will need lessening in size, since perforation and extraction under such circumstances are serious operations, which may easily injure the mother (§ 534). But version cannot always be avoided even in such cases (with transverse presentations, or with a presenting head which is difficult to open, on account of its high situation and its position).

3. The presenting part must not be so firmly pressed into the pelvis, that the hand can neither get past it, nor push it upwards. The expulsion of the head or shoulders into the obstetrical cervix which has been stretched for a long time, in other words the retraction of the internal os over the presenting part, renders the operation difficult and dangerous, but does not prevent it.

Version in itself is not dangerous either for the mother or child, provided the operation is performed correctly and gently, and that sufficient precautions against infection are taken. But of course it is impossible to prevent the admission of air into the uterine cavity. If, in spite of this favourable prognosis, 7—8 p. c. of the women who undergo the operation, and about 30 p. c. of the children perish in consequence of, and after, it, this mainly arises from the abnormal conditions which necessitate the operation, and from the many kinds of difficulty under which it has to be undertaken. In regard to the children, it is the footling presentation and the subsequent extraction which is so frequently required, that give rise to the danger.

§ 899. The *preparations* consist in a careful study of the mechanical conditions of the fœtus and its relations to the uterus and pelvis; also of course in seeing that the bladder and rectum

are empty ; in placing the woman in a suitable posture ; and in preparing everything that will be required for receiving the child. No *instruments* are necessary, except one or two fillets with a porte-fillet, although it is desirable to have the forceps at hand, in case this should be wanted for extracting the after-coming head.

As a rule the operation is best performed, as the woman lies on her back. The *lateral posture*, which has recently been again advocated by Zweifel (*Lehrbuch der operativen Geburtshülfe*, p. 109), is less unpleasant for the woman, but to some extent hinders the operator from co-operating from without with his free hand ; moreover it prevents a close supervision of the anæsthesia, and is unsuited to the extraction, for which, in case of difficulty, the woman must be again placed on her back, this being well raised. The lateral posture may be recommended, where the uterus is very pendulous anteriorly, and where the dorsum of the child looks backwards. Under such circumstances it is very difficult, where the patient is on her back, to seize the feet which are directed to the front, apart from the inconvenience and fatigue involved in manipulating with the arm pressed against the anterior wall of the pelvis. Here the woman of course should lie on the side which corresponds with the breech and feet. The operator always stands behind ; when the woman is on her right side, he introduces his left hand, and *vice versa*.

Except in a few cases, the knee-elbow posture has been rendered superfluous by the adoption of the lateral posture, and especially by the latero-prone position, with the pelvis at the same time somewhat raised.

If the operation is performed in the *dorsal posture*, this can be done in the woman's usual bed in easy cases, and where extraction need not immediately follow ; but the sacrum of the woman should be slightly elevated, in order to allow the operator to depress his elbow. Nevertheless the full lithotomy position is preferable, especially for inexperienced accoucheurs, and where the extraction is likely to be difficult. The semi-lithotomy posture however (*cf.* § 875) may be tried, and generally suffices.

Where there are no great counter-indications, the operation should be carried out under complete *chloroform anæsthesia*, this only being dispensed with in the easiest cases (where the

parturient passages are wide and very yielding, where the bag of membranes is entire, and no complications are present). Anæsthesia prevents the pains, which would otherwise be caused by the mechanical irritation of the parturient canal and by the uncontrollable bearing down, and gets rid of the disagreeable action of the abdominal muscles and the restlessness of the woman. The operator can thus do his work in quiet, and is enabled, as is so very important, to complete the version without using violence.

§ 900. *The question whether it is best in turning to bring down one or both feet* has been decided in favour of, generally speaking, only one foot being dealt with. The principal reasons for this are the advantage which an incomplete podalic presentation has over the complete (§ 187), the fact that it is easier to seize one foot than two, and lastly that it is quite as easy to turn and, where necessary, to extract by means of one leg as by two.

Only where exceptional conditions are present, may this rule be departed from. Thus, in the first place, where the uterine parietes are closely applied to the fœtus, and the internal os is greatly retracted. Here by bringing down both thighs, more room is gained for turning the child; the version too is facilitated, inasmuch as more force is available, where both feet are pulled at, and this force is more uniformly distributed over the trunk. Again, it is often a good plan to bring both feet down, when there is a complete, or nearly complete, dorso-posterior position, both with transverse and head presentations, and when there is reason to fear that, if only one foot is brought down, the remaining thigh may remain hitched over the anterior pelvic wall; this danger is especially great, where the pelvis is at the same time contracted, or where such contraction exists as would often make it desirable to produce a complete footling presentation, even though the relations of the fœtus just referred to were not present. Lastly, under some circumstances rupture of the uterus may be an indication for turning with both feet; since if only one foot is seized and drawn upon, the other may pass into the tear and enlarge it (I have stated in § 894 that the combined mode of version should always be tried first, where the uterus is ruptured).

It is always best to seize the nearer foot. In transverse pre-

sentations therefore it will be the lower ; in head presentations the one that is directed more posteriorly, since the hand almost always passes upwards along the latero-posterior uterine wall. The same rule applies also to dorso-posterior positions, since the possible disadvantage of producing a pelvic presentation with the dorsum looking backwards, where the lower foot is seized, is not a serious one, owing to the fact that the dorsum almost always rotates to the front of its own accord during the exit of the child, the choice of the foot having no influence on the direction of the abdominal surface after version. Moreover it is easy to turn by the lower foot even in those conditions, and where not, it will always be practicable to bring down the other also. It is only where version is to be at once performed with both feet, that the upper or more distant one is to be seized, and the lower one also grasped and brought down at the same time. There is no need to dread the so-called crossing of the feet ; it is easily avoided, if the manipulations, which will immediately be described, are followed in searching and grasping the feet, nor *per se* is the complication a serious one.

On the other hand version with the *knee* should only be performed in those cases in which, owing to want of room, it is either not possible or too fatiguing to seize the foot. In such a case moreover the knee should not be brought down into the brim, but the leg brought down above the latter, since otherwise the leg with the foot is apt to hitch over the edge of the pelvis. The same might happen over the edge of the os, if the operation were performed before its full dilatation.

As a general rule it does not matter which hand is chosen for turning. If the side on which the breech and feet are lying is known, the hand which corresponds to that side should be selected ; if not, the left, since the feet in the majority of cases lie on the right. If the practitioner has accustomed himself always to use his left hand for intra-uterine operations and to keep the right at liberty (as I always do), he will naturally select that left hand *for any case of version*, and will be able to manage well with it, even should it not correspond with the position of the fœtal pelvis ; and if he does happen to meet with difficulties, change of hands will be easily effected. Less experienced operators however should always choose the hand which corresponds with the position of the fœtal pelvis.

All this however only holds good, where the parturient woman is on her back. Where she lies on her side, such side determines the question, since the accoucheur invariably stands at the back of his patient, whether the fœtus is in a dorso-posterior or dorso-anterior position¹.

§ 901. The operation itself may be divided into 3 acts: the passage of the hand through the vagina and os, the search for, and seizure of, the foot, and the turning of the child. As regards the *modus operandi*, the following rules hold good, although in some cases they need not be slavishly adhered to, and in others will doubtless be found lacking in some details. On the whole however their value as guiding principles will not be lessened.

1. From the moment that the hand attempts to traverse the os, until version is complete, the free hand must continue to fix the uterus *ab externo*; it must maintain the latter in the median line, prevent the inner hand from forcing it away from the pelvis, and assist the internal manipulations by well directed pressure.

2. No manipulations and movements within the uterine cavity must take place during a "pain". As soon as the latter sets in, the internal hand must remain still and flat, in whatever position it happens to be.

3. The arm, which is about to be used for turning, must be bared up to the middle of the humerus, and then disinfected, and greased as far as the elbow. The introduction will cause pain and forcing, and must therefore be effected in the interval between two pains. The index and middle fingers, and then the two last fingers, are first of all introduced, followed by the thumb, care being taken to avoid carrying the nymphæ or the hairs of the pubes in at the same time. The hand, formed into a cone, will first lie in the sagittal diameter of the vulva, and

¹ Kristeller (*l. c.*) advises the operator to stand in front of his patient, where the position is dorso-anterior, for the reason that the palmar aspect of his hand will then be directed towards the abdominal surface of the fœtus. This, although theoretically an excellent suggestion, is impracticable; for the parturient woman is completely flexed towards her anterior surface, if she lies properly on her side. I admit that when the accoucheur stands behind his patient, the path which his hand takes in reaching the feet is not quite a straight one, where the back of the fœtus is directed forwards. But this does not signify; if only the palmar surface of the hand is passed over the side of the fœtus which is directed downwards it will in this case also soon reach the lower foot.

afterwards be directed with its dorsum towards the posterior bays of the pelvis, advancing with a rotatory movement as far as the os; the latter must not be traversed, until the wrist blocks the vulva. At this point the fingers (the free hand lying on the uterus, meanwhile co-operates from without in the way described above) are pushed one after the other (either at one side, or in front of an ilio-sacral synchondrosis) through the os, and kept extended, until the wrist occupies the latter.

4. If the membranes are still intact, they are now to be ruptured during an interval between two contractions; the wrist, which is filling up the os, prevents the escape of the liquor amnii, at any rate in its entirety. It is not wise to rupture the bag of membranes higher up, and to gain access to the feet by passing outside the membranes. The uterine mucosa is apt to be injured, when that is done, whereas the membranes protect it, where the manipulations are carried out entirely within them; there would also be a serious risk of disturbing the placenta; and lastly, the advancing fingers are apt to be covered by the slippery, lax membranes, and hindered in their action and entangled with them after the rupture. As soon as an opening has been produced in the membranes, the hand should pass through it, once again investigating (which is now much easier) the presentation and attitude of the fœtus, and then at once search for the foot.

§ 902. 5. Under the circumstances that have just above been supposed to exist, *i.e.* where the liquor amnii is retained *in utero*, the hand usually passes both quickly and by the shortest path over the abdominal or latero-abdominal surface of the child to its lower foot, and is able immediately to grasp the latter; this limb will easily be distinguished from an arm, if the parts which present themselves to the hand are carefully examined. A mistake however has not infrequently been made by my pupils and by young practitioners in my presence; indeed in my own case the umbilical cord has more than once got between my fingers, with the effect of both interfering with the performance of the operation, and occasionally too of causing injury to the child. I advise the practitioner therefore always to conduct his search for the feet in a systematic manner. For this purpose the hand with adducted (closed) finger tips, and free thumb, is to be laid flat on the side of the presenting shoulder (with a head presentation on the nearer shoulder), and gradually pushed along this side, until it

reaches the breech (fig. 126). The finger tips must throughout keep touch with, and never leave, that side; moreover they must not only go as far as the hips, but far enough to be able to cover the fissure between the approximated thighs. They next draw the nearer thigh somewhat downwards and towards the abdomen of the child, glide along it to the popliteal space, flex the leg by pressure on the latter, and thus bring it within reach. Some of the fingers will now be able easily to grasp the foot, or, as is often also possible, by gliding down along the thigh, to at once and entirely bring down the leg.

6. Precisely the same procedure must be adopted, if version is performed, after the amniotic fluid has escaped. If the presenting part hinders the introduction of the hand into the uterine cavity, it must be carefully raised and pushed a little towards the side which is opposed to the breech. The hand next seizes the presenting part like a fork, palpates it, and is then placed against the trunk and pushed towards the breech in the manner already described. If the space within the uterus is very limited, and it is found difficult to push on the hand, the wall of the uterus must be spared as much as possible, and the hands invariably kept close upon the body of the child, the finger

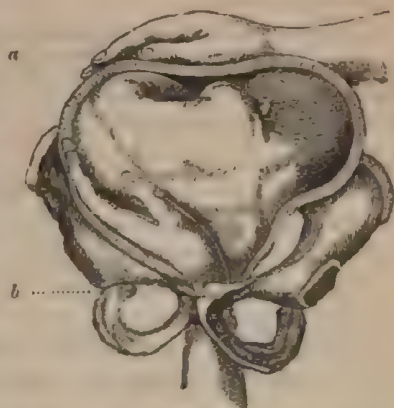


Fig. 126.

The inner hand (*a*) is advancing towards the feet in a case of transverse presentation, while (*b*) the outer hand fixes the uterus (the abdominal walls are not represented).

tips especially remaining in constant contact. The best plan is then to push on the hand by a wormlike, crawling movement, by first allowing the wrist to advance, and then pushing on the fingers by straightening the previously curved hand. In this way the breech may be reached even in the most difficult cases, when once the hand has got fully into the uterus.

7. If it is intended to turn with *both* feet, the hand must be pushed far enough over the breech to be able to grasp the distant thigh with the tips of the fingers. This is then drawn down and

towards the abdomen of the child, the lower one being brought down with it. The feet may be reached by the proceeding described under 5. If possible, they should be seized in such a way, that the middle finger passes between them, and the remaining fingers are distributed over their outer sides. Where however there is want of room, the feet should be firmly grasped with the whole hand.

When it is not practicable to bring down both feet together, the nearest one is seized first, and the hand then passed along it to the thigh that is still retained, and which is to be brought down into the vagina in a similar fashion. If however the one that is first brought down, seems disposed to glide back again into the uterine cavity, it may be encircled by a noose, which will hold it firmly.

8. The version of the child follows immediately on the seizure and bringing down of the foot; indeed it is mainly effected during the latter. The foot must be brought down in the same direction as that in which the hand is passed in, the process being carried out steadily and without jerks. The traction should moreover be directed towards the side on which the head lies, the ascent of the latter being assisted from without.

The more liquor amnii remains *in utero*, the easier will be the version. But where there is difficulty, and the originally presenting part does not soon move up, the disengaged thumb of the operating hand may push it aside and upwards; the ball of the hand exerts a similar pressure, while the foot is being pulled down.

Version is complete, as soon as, but not until, the hips have passed into the brim of the pelvis, and the knee therefore has reached the external genitalia. Until this has happened, we cannot be sure that the child is lying longitudinally. The treatment appropriate to a podalic presentation should now be adopted.

Complications of Version.

§ 903. As a general rule when the membranes have ruptured, an arm is found prolapsed, and usually this will be the lower one, either because it already presented within the bag of membranes, or because the uterine contractions afterwards squeezed it out. The upper one only becomes prolapsed—except where it

is brought down by unskilful attempts at version,—when the abdominal aspect of the child looks a good deal downwards. Such a prolapsed arm does not interfere with version or with the subsequent podalic delivery; indeed it may, if necessary, serve to assist the extraction, and at any rate it is not likely afterwards to be extended upwards, so that the prolapse is, if any thing, an advantage, and no attempt at reposition should be made. Indeed as the arm is not fixed and usually does not become extended upwards from the trunk, it may be left entirely out of consideration; or else, bearing in mind that extension occasionally occurs, and that the arm with a noose round it may be of use during extraction, the operator may slip such a noose round and with its help hold the arm loosely at the anterior margin of the vulva. If the limb is flexed and lies in the vagina, it may in that case too be brought down.

§ 904. *Where the uterus is firmly applied to the child, where the body of the uterus is greatly retracted upwards, and the shoulder is driven firmly down into the brim, it may be an extremely difficult matter to reach the feet, as well as to seize them and to turn the fœtus, indeed the version may cause the operator severe pain. In such cases deep chloroform narcosis should be induced, after the previous injection of morphia, combined, if necessary, with the injection of atropine (cf. §§ 466—468). The difficulty will thus almost always be overcome, and all the so-called means of "relaxation" rendered superfluous. If during the attempts at version, which are practised in such a condition of anæsthesia, the uterus is firmly pressed against the pelvis from without, the feet will almost always be reached, without running the risk of rupturing the expanded lower segment of the uterus.*

Where there is a great want of space at the pelvic brim, it is sometimes possible to gain a little room by bringing down both arms, or, since one has generally already prolapsed, the second (Levret).

Should the accoucheur be unable to reach the feet, the "préparations" of Levret (*L'Art des Accouchements*, 3rd ed. Paris, 1776, §§ 756 and 767), followed by Deutsch's manœuvre (*Heidelberger klin. Annalen*, iv., 1828, p. 314), are said to render this possible. According to the first author, the presenting part is seized by the hand which forms a fork, and

pushed somewhat up, until it becomes movable; the trunk is then, as suggested by Deutsch, turned in the shortest way round its longitudinal axis, until the abdominal aspect looks more downwards, and the feet thus become easier of access. But these manœuvres, in order to be successful, require that the child be so mobile, independently of the uterus, that where they can be carried out, they must also be superfluous; and under such circumstances, with skill and a proper use of the lateral posture, one foot at least may be reached without them. In a very large number of cases of version I have never required them.

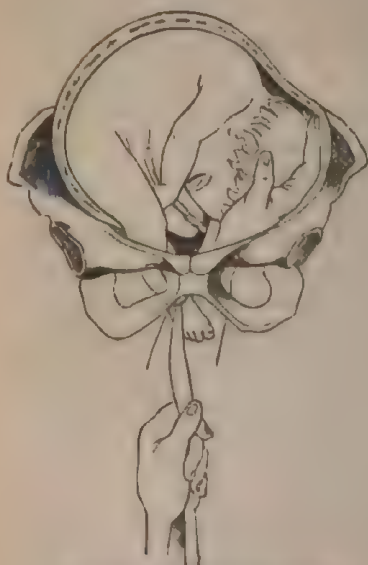


Fig. 127.—Bimanual method with head presentation.

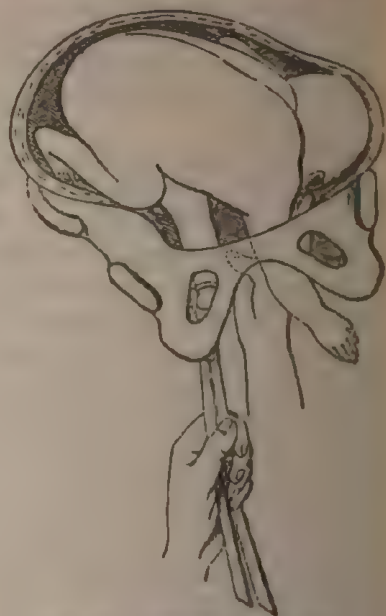


Fig. 128.—Bimanual method with transverse presentation.

A commoner difficulty than that of reaching and seizing the feet, consists in turning the fetus, especially where, as already observed, the presenting portion is expelled into the greatly dilated cervix, from which it will not recede into the uterine cavity. Under such circumstances the so-called "bimanual method"¹ (*doppelter Handgriff*) may be of use, and I have

¹ It is recommended by Justine Siegemundin, in many parts of her book *Die Thüringisch-brandenburgische Hof-Wehe-mutter*, Cölln an d. Spree, 1690.

often resorted to it with advantage. A fillet is passed round the foot, which has been brought down, while (the thigh meanwhile being pulled upon by means of such fillet) the other hand or several fingers of it are introduced into the now freer parturient canal and push the presenting part upwards (figs. 127 and 128). No violence however must be employed in pushing the fetus upwards, otherwise the lower segment of the uterus will be severely bruised or even ruptured. The presenting part must rather be pushed steadily and gently, and not directly upwards, but away from the point at which the uterus is stretched, and towards the middle line.

If the foot cannot be brought far enough down to enable the fillet to be applied directly, the latter must be passed round it with a porte-fillet, since of course the leg cannot be let go. For this purpose an umbilical cord repositor (*cf.* p. 342) or else the very serviceable instrument designed by Trefurt (fig. 129)¹ may be used.

§ 905. The rules, given above, will be sufficient to guide the accoucheur in an ordinary case, and any necessary modifications will be determined by the particular conditions that may be met

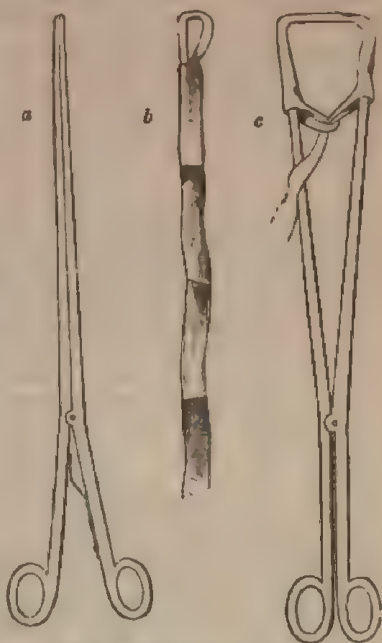


Fig. 129.—Trefurt's porte-fillet.

¹ This consists of two arms, which diverge when the handles are pressed together (*a*). It measures 38 cm. (15 in.) in length, is gently curved upwards, and the arms grow thinner towards the point. The fillet, belonging to the instrument (*b*), is provided with long pockets measuring 6–7 cm. (2½ in.), at a distance of 5–6 cm. (ca. 2 in.) from each other, of which the ends looking towards each other are closed. When the loop has been formed, the arms of the instrument are passed into those pockets, and the closed instrument is passed up to the feet. On getting there, the fillet is opened (*c*) by pressing the handles, and a foot is pushed into it. The instrument is now withdrawn, and the noose fixed to the foot with the fingers that are holding it.

with. With care and patience, if minute directions are not too nervously adhered to, and above all if a good use is made of anæsthesia and of appropriate posture, the object in view will almost always be attained. Only very rarely will it be necessary, instead of turning, to remove the fœtus by embryotomy, in the way indicated in § 646.

LITERATURE.

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3. Extraction by the Pelvic Extremity.

This operation can only be performed with a podalic or with a breech presentation.

a. Podalic Extraction.

§ 906. This as a rule follows immediately on podalic version :

(1) because the latter is very often merely practised as the preliminary to extraction, this being the true indication ;

(2) because where version has been practised on account of some abnormality of presentation, position or attitude, the life of the fœtus is usually so greatly compromised by the preceding interference and the conditions which necessitated it, that the child runs more danger, if further delay is allowed, than if it is rapidly delivered by its feet. The only exceptions are formed by a few cases of version from a transverse presentation, in which the podalic labour may be allowed to continue spontaneously.

(3) Podalic extraction is also always required with primary podalic presentation, whenever the conditions call for an acceleration of delivery. These conditions vary greatly in their nature, but in the majority of footling presentations are due to the interference with the fœtal interchange of gases, that so often sets in during such labours ; and we know that the delivery of the upper half of the trunk must almost always be artificially accelerated, owing to the fact that that interference increases, as the size of the uterine cavity diminishes.

The requirements for the performance of extraction are the same as those for version. But the width and, if dilatation is not yet complete, the distensibility of the os uteri must be much greater, since even if the tense edges of the os allow the passage of the trunk, when forcibly drawn upon, they will nevertheless retain the movable arms, and after delivery of the shoulders may so suddenly contract round the neck that the head is, as it were, caught in a sling. The manipulations that are then required for liberating the arms and head may prove extremely difficult, sometimes impossible, while they require so much time for their execution that during them the child is certain to perish.

The prognosis in cases of extraction is favourable for the mother, since the soft parturient passages are not exposed to any great injury, and the hand but rarely comes in contact with the uterus. The one exception to this rule is where extraction is undertaken, before the uterine and vaginal orifices are sufficiently

prepared. If the mother in other cases is injured by the operation, such injury arises from the causes which necessitated the latter, and above all from pelvic contraction. The danger which accompanies too hurried an evacuation of the uterus, can always be prevented by external pressure.

The prognosis for the child depends on the difficulties, which oppose its rapid extraction. Where those difficulties do not exist, the prognosis is as good as in other cases of head-last labours (*cf.* § 187); indeed even better, since the extraction rescues the child from the dangers pertaining to such. If however it is impossible to extract the child rapidly, on account of mechanical obstacles, if these are due to the position and attitude of the fœtus or to disproportion in respect of room, the risks of asphyxia and of premature respiration are very great; to these must be added the direct injuries to which the limbs, the abdominal organs (especially the liver), the spinal cord, and the skull are exposed, in consequence of the pressure that is brought to bear on them, and these injuries are sometimes unavoidable. But the principal immediate danger invariably arises from the asphyxia, caused by delay in the delivery of arm and head.

For these reasons some have advised that respiration be induced and maintained, while the head is still in the pelvic cavity, this being done by conducting air to the larynx, either by passing two fingers into the mouth and pressing down the tongue (Pugh), or else by flexible tubes (Weidmann's *veetis-neroductor*, Heeking's or Baudeloque's air-conductor—*Luftleiter*). Any instance of success however will always be due more to good luck than to anything else. Moreover the proceeding can only be carried out, where the head is low, and where there are no serious complications, which require the entire employment of both hands.

§ 907. The *preparations* for the operation are the same as those for version. The inexperienced practitioner will find the extraction inconvenient, if tried while the woman is lying on her side, the extraction of the arms being particularly so. Nevertheless, if the mechanism of pelvic presentations is well understood, the extraction in this posture also will be readily accomplished, and the practitioner will derive much assistance from the freedom with which the body of the fœtus can be moved in the varying directions of the parturient axis. As a general rule however the dorsal posture with raised and exposed buttocks, *i.e.* the complete or incomplete lithotomy position (*cf.* § 875), is preferable, although where the operation seems likely to prove an easy one, the woman may be left in her previous position in her

bed, the sacrum being raised. But the operator must then sit at her side, while operating.

A fillet as well as a pair of forceps should be at hand. Chloroform is unnecessary, since the extraction causes but little pain, and the co-operation of the abdominal muscles is often desirable.

§ 908. The following are some *general rules, which should be adhered to in every case of extraction.*

1. All precipitate and unnecessary manipulations about the child must be avoided. On the other hand the further the body of the fetus emerges after the delivery of the breech, the more rapidly is the extraction to be completed.

2. The body of the child is always to be seized, as near to the maternal parts as possible. The further therefore it is expelled, the higher up must the operating hands be shifted; this is the best way of avoiding any dragging on the parts or joints which lie between the legs of the fetus and the portion of its body that is lying in the vulva. The only exception occurs during the exit of the abdomen, on which no pressure must on any account be made.

3. The expelled parts are to be wrapped in a not too cold, smooth cloth, which will prevent the slippery parts from gliding out of the hands, and preserve the skin from injury.

4. Traction must always be assisted by pressure on the fundus and body of the uterus, which is to be exerted by the hand of an assistant, under guidance of the accoucheur. It is a good plan only to exert such pressure during the "pains", provided these are sufficiently frequent; on the other hand the pressure may make up for the absence of such pains. In any case however traction and pressure should only be made at intervals, so as to imitate the spontaneous mode of expulsion. The simultaneous use of traction and expression is the surest way of preserving the normal flexed attitude of the arms and head, if such a result is at all feasible.

5. The pull must always be made exactly in the directions which were indicated, when we described the mechanism of pelvic presentations, *i.e.* as a general rule in the direction of the axis of the brim, as long as any part of the body still lies above that region. It is only an unduly resisting pelvic floor, that now and again requires that this direction, *i.e.* backwards and downwards, be modified. Where the resistance is great,

pendulum movements in the axis of the parturient canal, viz. alternately up and down, are allowable.

6. It is, generally speaking, bad practice to resort to rotatory movements, with a view of causing the dorsal surface which is primarily directed backwards, to look forwards. They are only allowable, when used to assist spontaneous rotation. This invariably takes place spontaneously, except where the arms occupy some abnormal attitude, and under such circumstances artificial rotation does no good. The operator must therefore be constantly on the outlook for any indication of natural rotation, especially during the exit of the lower half of the body; and it will be best ascertained by the movement, which the expelled parts, or those that are waiting to be expelled, perform either during a pain, or while the parturient woman bears down. Of course the parts must at such a moment be left entirely to themselves.

While the thighs and hips are being drawn out, the rotation of the dorsum forwards is best assisted, if the operator pulls on the anterior thigh. If only one presents, an attempt may be made to conduct this towards the pubes in the way that nature intends; for even with spontaneous labour nature makes an effort to bring the prolapsed thigh into this direction, so that the remaining one may pass out over the perinæum.

§ 909. The extraction may be divided into *three acts*: the extraction of the trunk as far as the shoulders, the extrication of the arms, and thirdly that of the head.

Act 1. The Extraction of the Trunk.

If both feet are lying in the vagina, the accoucheur should first of all introduce half his hand, with a view of making out whether they are crossed, and if so, of disentangling them. He then seizes the feet in such a way that his middle finger lies between them, while his index and ring fingers lie on their outer aspects above the ankles. If one foot is placed at a higher level than the other, the highest one may first of all be drawn down with two fingers to the same level as the second. As soon as the feet are delivered, he lays the index finger of each hand on the heel, the middle finger on the dorsum of the foot, the thumb on the sole, and then pulls, until the calves appear. During the subsequent traction, each thigh is evenly held with the hand which corre-

sponds to it, the thumb being laid on the posterior surface, and the four other fingers distributed over the anterior. The finger tips must lie free, and not be buried in the thighs. As soon as the pelvis comes within reach, the thumbs are laid parallel to each other on the middle of the sacrum, the remaining fingers lying at the sides of the hips and the antero-lateral portions of the thighs, so that the whole hollow of the hand lies evenly and loosely against the body of the child. Undue pressure might injure the pelvic articulations (Ruge). If the pelvis is too bulky to allow of the thumbs being placed side by side on the sacrum, they may lie on the nates instead. During this act, which is usually rapidly completed, it is most important to be on the look out for, and to promote, spontaneous rotation of the dorsum.

If only one foot presents, the accoucheur may begin by extracting this with his index and middle fingers, and then proceed to seize the leg and thigh with both hands, in the way already described, until the breech reaches the vulvar aperture. The index finger of the corresponding hand may then be hooked into the bend of the thigh which is still extended upwards (*i.e.* the right finger is used, if the right thigh is retained), while the thumb is placed next to its fellow either on the sacrum or the nates, and the remaining fingers are flexed in the palm. If this hooking of the finger into the groin proves difficult, it may be managed, where the anterior foot presents, by raising and pressing that foot into the angle of the pubes; where the posterior presents, by pressing it towards, and into, the perinaeum. As soon as the hips have descended, the limb which till then had been retained, at once glides out of its own accord, or it may easily be extricated by grasping the foot, in case the limb is flexed. Should it however have been completely extended, the leg and foot will not be liberated, until the abdomen makes its appearance, which latter may be accelerated by well raising the trunk.

If a thigh is extended upwards, no attempt must be made to bring it down, when once the hips are firmly fixed in the pelvis. Its flexion within the narrow space at our disposal is impracticable, while on the other hand the thigh would have to describe a very large curve, if brought down without being flexed. Any attempt will certainly break the limb and probably seriously damage the floor of the pelvis. Should there be any reason for wishing to bring down the second thigh, this must be done

early, while there is still room for flexing it either above, or at, the brim of the pelvis. If the foot is still very high at that period, the accoucheur may pass his hand along the presenting thigh to the genitalia of the child, and then (unless the foot is immediately found) turn it towards the hip concerned. He next glides his hand over the thigh to the popliteal space, and presses the leg down towards himself. During the manœuvre there is sometimes an advantage in passing a noose round the presenting foot, so as to hold it down, and to ensure a *point d'appui*.

The extraction is to be continued with the help of the pelvis of the child, until such time as the operator can grasp the thorax. The abdomen must not be pulled, for fear of pressing on the umbilical cord and liver. The course to be adopted where the cord is very tight, and the fœtus "rides" upon it, has already been mentioned in §§ 188 and 657. The thorax must be seized with both hands, just as the pelvis was previously, and drawn out in the direction of the corresponding oblique pelvic diameter, until the shoulder blades can be felt and seen in the pelvic outlet. If there is much resistance to this, it may be overcome by traction and the use of up and down pendulum movements, provided of course that it is not the arms that, by being extended upwards and lying in the brim of the pelvis by the side of the head, prevent the descent of the head.

Act 2. The Extrication of the Arms.

§ 910. Occasionally one or other hand descends by the side of the trunk. It should then be pulled upon and the corresponding arm extracted, the shoulder being drawn down by means of the latter.

But if such is not the case, the arms must be fetched out of the pelvis, *i.e.* be released by the accoucheur. For this purpose he lays his hand flat upon and seizes the hip which looks downwards. He then (without however exerting any pressure on the hip) slightly raises the trunk, and passes two fingers over the perinaeum into the parturient canal, for the purpose of discovering the situation of the arms. If a hand of the fœtus can immediately be felt, this is to be pulled, as if the operator wished to adduct the arm belonging to it; this manœuvre will effect its release without any risk of injury.

But supposing one or both arms are abducted and extended upwards, a different mode of liberation must be adopted. The best plan is then always to start with the arm which is most accessible, which will usually be the posterior one. The accoucheur should always select for the operation that hand of his, which corresponds to the arm of the fœtus that is to be liberated. The other hand, after seizing the trunk at the hips from below, raises it a little and lifts it towards the opposite side, at the same time rotating it somewhat round its longitudinal axis, in such a direction as will carry the shoulder belonging to the arm that is to be liberated, towards the sacrum. When this has been done, the index and middle fingers, if the shoulder is already very far down, or half the hand, when the shoulder is high, is to be passed over the shoulder and along the outer side of the arm to the elbow-joint. If this joint is now pushed and drawn towards the anterior surface of the child, and at the same time somewhat downwards, the upper arm will be adducted, and the forearm approximated to it; in this way the limb will be pushed across the anterior surface of the child towards the opposite side and out of the genitalia. The arm is thus moved towards the child and carried round its anterior aspect.

The extrication of the second, *i.e.* the more anterior, arm, is to be effected in the same way. The operating hand however is now changed; the one that before was extricating the arm, this time holds the trunk. In order to be better able to carry the shoulder backwards, the operator must turn the trunk more round its longitudinal axis than he did in the case of the first arm. A gentle pressure, exerted backwards upon the shoulder, will assist the movement.

Difficult extraction of the arm.

§ 911. If however the last-mentioned movement does not succeed, *if the arm is fixed in front*, and is found very difficult to liberate, it may be possible in some cases to rotate the shoulder to the side and backwards, by rotating the whole body of the fœtus in this direction. For such a purpose the accoucheur takes the trunk of the child between his two hands, the tips of the fingers of one hand being applied to the lower surface of the chin, and those of the other to the occiput, and in this way the head and trunk are simultaneously turned.

If this plan also fails, the best way is for the operator, while

depressing and holding the trunk towards the opposite side, to carry half or the whole of his hand in behind the anterior pelvic wall over the shoulder to the elbow, and to push this together with the shoulder backwards and downwards. The humerus must never be acted upon alone, since it would break; the elbow-joint is the region upon which force must be exerted.

If the shoulders continue very high, or if, while the head is in, or above, the pelvic brim, the face is unfavourably placed, or if there is great want of room, the same proceeding should be adopted. But under such circumstances the whole hand should be passed into the parturient canal, as far as is necessary in order to act comfortably on the elbow. By this method—which is mainly that recommended by Huter (*l. c.*),—I have succeeded in liberating the arm, even in the most difficult cases. It is important however, while raising and rotating the trunk, not at the same time to pull upon it too vigorously, since the accessibility of the elbow and fore-arm will be interfered with, if the head is pulled down and those parts get impacted. On no account should an attempt be made to bring down the arm, by pulling at the shoulder; such a plan is very apt to injure the clavicle.

If one or both arms lie against the nape, “if they are crossed over it”,—which is almost invariably a result of precipitate traction and erroneous rotations,—they may frequently be released by raising and rotating the trunk, and by a consequent displacement of the upper arm and elbow-joint backwards and downwards. If not, the accoucheur may extricate the limb, by passing his hand in behind the anterior wall of the pelvis, as described above.

If the abdominal aspect of the child has remained directed forwards—which likewise is usually the fault of the accoucheur—the trunk here again must first of all be raised in the manner already described. The accoucheur then, with a view to liberating the posterior arm, passes his whole hand in over the dorsal side of the child (*i. e.* over the perineum), and carries his fingers, with their palmar aspect directed forwards, over its shoulder. He next presses that shoulder down a little with those fingers, and (while the hand glides somewhat round the child) slips them along the upper arm to the elbow-joint, in such a way that their palmar aspect now looks more downwards; this arm is then drawn down over the face and chest. The trunk must be well

depressed during this manœuvre, so as to make room at the antero-lateral wall of the pelvis.

If all these various methods are fully made use of, it will only rarely happen that the arm cannot be liberated from its impaction, or at any rate cannot be so within the limits of time allowed, in respect to the extraction of the head. When however such is the case, the arm must be drawn out at the same time as is the head; or should this not be possible, it would no doubt be allowable to pull it out over the dorsum or in some other way, even at the risk of one or more fractures, *i.e.* where it is a question of saving the highly endangered life of the child. Of course where life is extinct, injury to the child is of no importance.

Act 3. The Extrication of the Head.

§ 912. The last act, namely the extraction of the head, is frequently the most difficult, but at the same time the most fruitful in good results; this is the time of greatest danger to the child, and its head therefore must be rapidly extricated. There are 4 principal methods of doing this, *i.e.* if we leave out of consideration small and immaterial modifications which have been suggested by one or other obstetrician.

(1) The method of lifting the head out of the pelvis, by applying some fingers to the face and some to the occiput (Smellie, Kilian), assisted by expression (Pugh, Martin).

(2) The extrication of the head, by simultaneously pulling on the nape and on the face; the pull on the face can be exerted by means of the upper jaw (Smellie's modified method, Saxtorph, 1783), or *per os* by means of the lower jaw (Levret, Veit).

(3) Extraction by pulling on the nape, and raising (rotating) the body (*Prague method*).

(4) Extraction with the forceps.

In the first method, *i.e.* that of Smellie, the accoucheur seizes the trunk at the hips and raises it a little with one hand, while the other is passed in underneath as far as the edges of the orbits. While the trunk is now resting on the fore-arm belonging to the last-mentioned hand, two fingers of the free one are applied to the occiput, and the head is lifted out, by simultaneously pulling at the face and pushing and pressing the occiput up towards the sacral concavity. The use of external pressure,

which was recommended by Celsus and Pugh, and afterwards more especially by Martin, greatly facilitates the proceeding.

In the second method, the fingers are passed to the face in the manner just described, the trunk also being supported as before. Two fingers of the other hand are next to be forked over the shoulders in such a way that the angle between them is in firm contact with the nape, and so to speak rides upon it; the tips of the fingers must be free, and not pressed into the soft parts. By this means very powerful traction can be exerted on the occiput through the nape. The fingers, which are applied to the face, must at the same time draw the chin downwards, *i.e.* approximate it to the chest; and in this way the head is delivered by their means and by the traction lever, which is formed by the fingers which are forked across the neck. Inasmuch however as the fingers that are acting on the upper jaw (Smellie) at the sides of the nose, can assist but little in flexing the head, it is better to let them act through the mouth on the alveolar process of the lower jaw—a manœuvre which was first of all suggested by Mauriceau and especially by Levret, and has lately come into general use, through the advocacy of Veit.

In the *Prague method*—which was introduced by Kiwisch (*Beiträge z. Geburts.*, i., p. 69, Würzburg, 1846), and has especially been made known through Scanzoni's *Lehrbuch der Geburtshülfe*—the operator seizes the fœtus by its feet with one hand and holds the body well down; he next forks the index and middle fingers of the other hand across the shoulders and presses those fingers firmly against the nape of the child. In this way the occiput is to be drawn down, at first gently, but afterwards more vigorously, along the posterior surface of the symphysis, until its base has reached the lower edge of the latter. By means of the other hand the body of the fœtus is now rapidly raised by its feet towards the abdomen of the parturient woman, while the forked fingers, which are applied to the nape, force the head against the perinæum, thus increasing the supporting surface, which is required for its rotation, and assisting in the extraction of the head.

§ 913. A good method of extraction must resemble the natural mode of exit of the head. Now we know (*cf.* Vol. I., p. 241) that, under normal circumstances, the head emerges in an attitude of strong flexion, so much so that the chin is directed downwards,

and the mento-occipital diameter almost corresponds with the axis of the pelvis. The maintenance of this condition of flexion is only ensured by the two first of the above methods, viz. those in which the fingers that are acting on the face before the extraction, flex the head, and continue to do so more and more, as the extraction advances. Nothing of the kind happens in the Prague method, in which simple traction at the shoulders and the raising of the trunk are relied upon to do everything. There the necessary flexion will only be easily and safely effected, when the flexion of the head that already exists, is not disturbed by any obstruction, *i.e.* where the head lies low, where the parturient passages are wide, and where the perinæum is narrow and lax. Under all other circumstances any flexion that is present, is actually diminished, instead of being increased, and it is by actual force that the head is extracted from the parturient canal. It is for this reason that, wherever there is any obstruction, the manipulations have often to be repeated several times, before the head emerges, and its exit is not infrequently accompanied by injury to the neck of the child and to the maternal parts. The only exception occurs, where the face has been drawn down before the traction is applied to the shoulders, and before the trunk is elevated; but in such a case it would be possible immediately to extricate the head, if a little assistance were given to the occiput or nape. I am obliged therefore to reject the Prague method, as an unphysiological and rough proceeding; the results which are produced by it, do not prove its excellence.

Of the other two methods, the simple one of Smellie (1), assisted by expression, is doubtless the gentlest; but it only succeeds rapidly, where the obstruction is but slight. Of course the modified method of Smellie or that of Levret and Veit (2) will also succeed under such circumstances; the latter is even more certain than the former, since the slippery upper jaw allows no firm grip. The latter method moreover is also most useful in difficult cases, and I am therefore induced, after many trials, to give it the preference. It is true that occasionally the angles of the mouth as well as the tongue are injured; but it is quite the exception for such injury to be serious. The injuries to the neck may no doubt be more important, but with difficult extractions they are frequently unavoidable, whichever method is used.

The conclusion we arrive at therefore is that in an *easy extraction Smellie's method* (1) assisted by expression, is the best; in all other cases the *Levet-Veit modification* (2) should be preferred.

§ 914. Hitherto we have assumed throughout, that the head was lying with its sagittal plane in the sagittal diameter of the pelvis. Where however such is not the case, the head must be brought into that position, before any of the methods referred to are tried. This rectification may be extremely difficult, owing to the high position of the head, to the contraction of the parturient canal, and to an unfavourably placed arm interfering with reposition. The necessary rotation of the head round its vertical diameter is most easy, indeed it usually only takes place, in the lower portion of the pelvis; if the head is therefore still in, or even above, the brim, it must first of all be brought further down. This may be done most certainly, especially in the case of pelvic contraction, by simultaneous traction on the nape and lower jaw (*cf.* § 521); instruments invariably do damage. But if when the head has reached the pelvic cavity or outlet, *the face still looks to one side*, the operator may cause it to look backwards, by applying pressure to the anterior cheek, either with two fingers or half of the hand; or else he may rotate the head in the required direction, by applying some fingers to it, as in the simple method of Smellie, or by passing his fingers directly into the mouth, instead of applying them to the face. The resistance of the vagina and perineum can hardly hinder these efforts to produce rotation, sufficiently to make it necessary to call in the help of the forceps.

Where *the face is directed forwards*, it will only be possible to seize the lower jaw, if the head is strongly flexed. As a rule however the flexion has been prevented by the efforts at extraction. Under such conditions the index and middle finger must be passed along the back of the child, and forked over its shoulders; a pull is then to be made forwards and upwards as in the Prague method, when the occiput will be brought down to, and out over, the perineum (Scanzoni). Occasionally the forceps may be useful under such circumstances.

§ 915. The indications for the *forceps* have been greatly restricted, since the introduction of the *Levet-Veit method*. Nevertheless there are some cases in which the use of that instrument remains the quickest method of delivering the head,

and therefore of saving the child. Such conditions are mainly those in which the head lies in the middle strait of the pelvis and is insufficiently flexed, where the traction on the lower jaw is unable to move the jammed forehead, and where the operating hand is exhausted; further where the chin is directed forwards and is hitched against, or above, the anterior pelvic wall. But where the head is lying above the pelvic inlet, or is fixed transversely in the latter with a contracted pelvis, it is not good practice to try to extract it with the forceps, any more than it would be under similar conditions, if the head presented.

In the last place, I must mention that the accoucheur must only persevere in his attempts to extract the head with his hands or with the forceps, as long as it is probable that the child will be delivered alive, or that, if it is dead, the operation will not endanger the mother. Under contrary conditions it is best to desist for a time, so as to allow the woman a time of rest, unless special circumstances necessitate interference; he may afterwards try some milder mode of extraction. If his attempt then fails, delivery must be accomplished with the help of craniotomy.

b. Extraction by the Breech.

§ 916. When breech presentations progress spontaneously as such as far as the exit of the hips, the conditions for the rapid transit of the upper half of the body are so favourable, that no interference is allowable, except where there is absolute necessity. The single exception to this rule occurs, as has been pointed out in § 188, in the case of some primiparæ with a narrow vulva and a tense pelvic floor, and especially in cases of general pelvic contraction and of prolapse of the cord. Under all these circumstances, there will be a strong probability that the breech labour will need acceleration, and, since this is difficult to effect in the lower regions of the pelvis, the practitioner will do well to convert the breech into a podalic presentation, while this can easily be done, *i.e.* early. This interference therefore is undertaken not on account of actual danger, but from a prophylactic point of view. But in all other cases it is only permissible, when extraction is definitely demanded, either on account of threatening circumstances, or because the pains are unable to terminate delivery within a sufficiently short period.

It is always best, even in the last-mentioned conditions, when possible, to *bring about a footling presentation*, since this renders extraction most easy and convenient. Such a conversion of the breech presentation can readily be effected, where the breech is still high and movable; sometimes too, where it has descended further, provided that it still recedes somewhat upwards, when pressure is cautiously applied. When however the hips have once reached the middle region of the pelvis, this conversion can only be effected, where the pelvis is very wide, and the breech is not large.

In order to bring down a foot (and, when possible, this must be the anterior one), the accoucheur should always select the hand which corresponds to the abdominal aspect of the child; this will be the left, when the left hip is most anterior, and *vice versa*. He now pushes the breech somewhat towards the dorsum of the child, and seizes the foot, if it is easy of access. When not, he passes the tips of his fingers along the corresponding thigh up towards the popliteal space, and pushes the thigh towards the abdomen of the child. The knee-joint having next been flexed, the operator seizes the leg which has thus been approximated, after which the feet will easily be reached. Where there is great want of room and great sensitiveness, it may be necessary to administer chloroform.

§ 917. *Extraction by the breech* itself is rarely an easy matter, since the presenting part does not offer any points, that can readily be taken hold of, and on which powerful traction can safely be exerted. There are four alternative methods to choose from: we may pull out the breech with the hooked index fingers (Mauriceau), or with a blunt hook (Smellie), or with a fillet which is carried into the bend of the groin (Peu, Giffard); or lastly we may extricate it with the ordinary midwifery forceps (Levret).

The special breech (hook) forceps—Steidle, Gergens, Ruhstrat, in the *Manuschrift f. Geburtshunde und Frauenkrankheiten*, xxxiii., and No. 11 in *Berliner Beiträge z. Geburt.*, i.—is inconvenient, more complex and dangerous, and less efficient than is the blunt hook, in a word it is obsolete. Quite lately Miles ("The forceps in difficult breech deliveries," *American Journal of Obstetrics*, vol. xii., 1879, p. 135) has recommended a breech forceps, which resembles the ordinary cephalic forceps, but which is better adapted to the pelvis of the foetus. It has not found favour in Germany.

Which of these alternatives is selected, will mainly depend on

the position of the breech and on its accessibility, in so far at least as such selection is affected by the parturient passages. If the breech is low, and the index fingers can simultaneously or alternately, and without much difficulty be passed into the bend of the groin, and if they can exert a good pull, without becoming too quickly exhausted, this method should be chosen, and it will almost always succeed. Where it is impossible to pull on both groins at the same time, the best plan is first to act on the anterior, then on the posterior, and so forth. The former must be drawn down behind the symphysis, and then the posterior hip is to be delivered over the perineum, this of course being the mechanism in spontaneous delivery. I need hardly say that the biiliac diameter of the child must be brought into the sagittal diameter of the parturient canal.

§ 918. Where the above method is not soon successful, or where it seems likely to fail, Smellie's blunt hook (fig. 130) or



Fig. 130.—Smellie's blunt hook.

the fillet may be substituted. Each of these is usually applied to the anterior hip, although under some conditions it is better to work on the posterior.

The *hook*, conducted by the finger of the free hand, is first of all passed into the genital canal; then, guarded by the finger, is slipped over the outer side of the thigh into the flexure of the groin, care being taken to avoid injuring the generative parts, especially in boys. The instrument must not be pulled on, until its point is felt to be free between the thighs. During the traction the operator must take great care not to exert any pressure on the thigh; when such care is taken, no danger is likely to arise. He may assist the traction, by hooking a finger into the other groin.

Laborde (*Lyon Médical*, 1878) and Delore (*Annal. de Gynæk.*, 1878) use a flexible hook, so as to be able to adapt it better to the pelvis and to the part of the child which is to be caught.

Hecker¹ has recently again recommended the *fillet* as a substi-

¹*U. Klinik der Geburtshunde*, ii., 1884, p. 61; *Jahresbericht der Münchener Gebärn-
stalt pro 1886*; and *Beobachtungen und Untersuchungen aus der Gebärn-
stalt zu München*, 1881, p. 35.

tute for the hook. The instrument, used for this purpose, is made of silk, and must not be too narrow. Before being introduced, it is rolled up into a ball, and then pushed with two fingers between the wall of the pelvis and the hip, being passed round the latter, and then brought down between the two thighs. The operator next passes up a few fingers of the same, or of the other, hand, and after finding the ball, pulls it down. The ends of the fillet then hang down loosely, and must be conveniently located, before traction is begun; that is they must lie in the groin and flat, not edgewise. In order to facilitate the finding and the seizing of the ball between the thighs, a button is sometimes attached to the end of the fillet, or else a ring, into which the finger can be slipped (Schmitt, *cf. Schmidt's Jahrbuch*, vol. 161, p. 162); Poppel passes the fillet with the help of an instrument, constructed on the model of a Belloc's sound, and resembling the blunt hook in size and form (*Monatsschrift f. Geburtsk.*, xxxii.).

The principal argument in favour of the fillet is that its width renders it less likely than the hook to cause injury. But there is very little risk of injury to the *femur*, even if the hook is used, provided it is properly placed and carefully pulled; while on the other hand injuries are possible with the fillet too, since it is apt to slip away from the groin on to the thigh and to act on the latter, as soon as the (anterior) hip is pulled forwards and upwards. Again, injuries to the *soft parts* are much commoner with the fillet than with the hook, since the former, while being used, gets twisted round its axis, and in that way, and owing to the moisture of the genitalia, becomes converted into a rough cordlike band, which cuts the soft parts. Various instances of this have been published (Schmitt, *l. c.*, Fritsch, Küstner); and I also have seen deep pressure marks in two cases in which I used the fillet, although I did so chiefly by way of experiment and therefore gently.

In order to avoid these disadvantages, von Weckbecker and Sternefeld (*cf. Becker's Beobachtungen &c.*, p. 37) recommend a soft flexible band of lead (*Heisband*) in the place of the fillet, while Bunge (*Centralblatt f. Gynäkologie*, 1881, No. 8) prefers a hempen cord, lined by an india-rubber tube, and which is supplied in front with an olive-shaped, metallic knob. The former obstetrician introduces his instrument with the help of a steel tube, which is bent into the form of a hook, while Bunge used a curved metal shell (*Hülse*) with a solid handle. Hüller (König. "Die Extraction des Kindes am Steiss mittels eines

Taschentuch." *Inaugural-Dissertation*, Marburg, 1881) has successfully used a folded handkerchief, which forms a soft pad, and leaves no pressure marks behind it.

Although then the fillet may be a serviceable instrument, it has no material advantage over the hook. The latter, if properly introduced, and carefully managed, need not do damage, while on the other hand it is not more difficult to apply than the fillet.

If nevertheless the fillet is preferred, the best plan is to use it in the way practised by Gifford, and lately again by Königsberg¹, *i.e.* to pass it through both groins and over the sacrum. The two ends then hang down between the thighs, and traction is made on the whole width of the sacrum, that is on the whole pelvis of the child, so that it is scarcely possible for the fillet to cut into the groin. But it is not easy to pass one end over the posterior hip, since this requires that the hand be passed in a long way. Indeed it seems to me that where that is possible, the extraction might, at any rate as a general rule, be managed without such assistance.

Runge (*l. c.*) advises that the fillet be not drawn tightly over the dorsum of the child, but be allowed to hang down over its back, while the two ends are carried through the groins to the abdominal aspect. In this way the fillet is practically divided into two halves, of which one lies in each groin. The rotations of the fetus may then be effectually assisted, by pulling sometimes at one, sometimes at the other, portion.

The extraction of the breech with the *forceps* has been almost universally given up. Only a few obstetricians (Huter, *l. c.*, Haake, *Archiv f. Gynækologie*, vol. xi., 1877, p. 558, Agnew, *Obstetrical Transactions*, vol. xix., 1878, p. 217) still recommend it for certain cases. The points of the instrument are very apt to crush the pelvis or else the abdominal organs of the fetus, if the breech is fully grasped by the cephalic curve.

When, but only when, the child is dead, can traction be made, by introducing the index finger into the anus, and hooking it over the pubic bones. The risk of seriously injuring the child forbids this method during life.

¹ Cf. Münster, "Zur Therapie der Steisslagen," *Deutsche Medizin. Wochenschrift*, No. 27, 1877.

As an appendix I bring under one heading the various

*Injuries of the Child which occur during Artificial Pelvic
Extraction,*

for the possibility of their avoidance depends largely on the practitioner being familiar with them; so also does his choice between the various modes of operating. In the following description I shall make use of the recent publications of C. Ruge and of Küstner, which are the most complete we have on the subject.

§ 919. (1) As we should expect from the nature of the case, the soft parts are chiefly damaged about the neck, rarely about the trunk, and most rarely of all about the limbs or face (mouth) of the child.

At and round about the neck, subcutaneous inter- and intramuscular effusions of blood are extremely common. *Hæmatomata of the sterno-cleidomastoid muscle* are especially so, an injury to which in recent times (1864) Bohn has again drawn attention¹. The injury may occur on one or both sides, although the latter is certainly the rarer occurrence; the sternal portion seems more often affected than the clavicular, but the upper half of the muscle may also suffer. With a head-first labour, this effusion of blood is only seen in exceptional cases, after the use of the forceps. Similar effusions may also occur either simultaneously or separately in the case of other cervical muscles, in those attached to the hyoid, and in the pectorales. Occasionally too subperiosteal hæmatomata of the clavicles have been observed, unaccompanied by fracture (Ruge).

These extravasations of course are due to laceration and bruising of the muscle; complete rupture however is very rare. External signs (swelling and discolouration) are only present, where the effusion is considerable, and where a subcutaneous one co-exists. As a rule these hæmatomata heal spontaneously, and without leaving permanent mischief; suppuration is rare. Nevertheless a cicatricial formation may lead to subsequent functional disorders, e.g. to torticollis.

¹ *Deutsche Klinik*, 1864, Nos. 28 and 52; cf. also Skrzeczka in *Vierteljahrsschrift f. gerichtliche Med. u. n.*, 1869, x., p. 129, and Fasbender, *Berliner Beiträge z. Geburt.*, v., 1873, Sitzungsbericht, p. 170.

Injuries about the mouth only occur, where the Levret-Veit method of extraction is used. They are rarer, the more skilfully that method is practised, but sometimes are quite unavoidable. In spite of all possible care, I have met with a fracture of the jaw, accompanied by a tear in the floor of the oral cavity (the child being dead); Ruge mentions similar injuries.

In the case of the *trunk*, bruises and extravasations are seen on the back, especially in the latissimus dorsi; next in frequency about the sacrum and hips. It is well known that the generative parts may be seriously injured; I have seen a new-born child, whose penis and scrotum had been entirely destroyed by the blunt hook.

Internal effusions of blood are most common in the abdominal and cranial cavities. In the former they are usually due to crushing of liver or even of the supra-renals. The other effusions into the retro-peritoneal and retro-pleural, areolar tissue are associated with injuries of the vertebral column. Extravasations of blood on to, and into, the brain and its membranes are the best known. They are very common, and of enormous size, when caused by rupture of the longitudinal or transverse sinus; when in the pia mater and in the cerebral substance itself, they are slight, but very diffuse. They may occur, quite apart from indentations and fractures of the bones.

§ 920. (2) Injuries to bones. I have already (§ 527) described the various injuries that affect the *skull*, namely fissures and fractures in the substance of the bones, rupture of the squamous suture, and separation of the tabular and basilar portions of the occipital bone. The last-named separation may in slight cases be a merely unilateral lesion, which can scarcely be followed as far as the middle line and is perhaps unimportant. But in other cases the tabular part of the occipital bone is pushed inwards and downwards over the cartilaginous region of the articulation, and together with the blood that is effused at the same time, presses on the cervical cord, which may be entirely divided.

The most serious, and unhappily not infrequent, injuries are those of the *vertebral column*, especially in the cervical region. They are generally due to the whole force of traction having been brought to bear on the trunk and neck, and particularly when the *Prague method* of extraction has been employed, since this is

accompanied by swinging movements, which act on the cervical region. Only rarely however is the neck torn through and the head consequently detached, such detachment being resisted by the soft parts, which hold much longer than do the bones (Duncan); this accident is as a rule confined to cases, in which the fœtus is macerated and immature. But with this exception simple injury to the vertebral column may occur in any fœtus, whether the pelvis is wide or contracted. It is rare for an intervertebral cartilage to be detached and for two vertebrae to be separated (Hecker, *Klinik der Geburtskunde*; Ahlfeld, *Archiv f. Gynækologie*, vol. v., p. 161).

Only one vertebra is affected in the great majority of cases, and even then it is the exception for the entire vertebra to suffer. The rupture is almost invariably limited to the body of the vertebra, and leaves the arch unaffected. The epiphysis¹ (i.e. the terminal portion of the body, which is separated from the diaphysis by a layer of cartilage, and to which the intervertebral ligaments are attached) is then torn away from the diaphysis, somewhere near the line of union; sometimes small portions of the diaphysis remain adherent to the epiphysis, sometimes the opposite condition is produced. The anterior vertebral ligament too is torn through. Indeed in rare cases it alone is involved, but then the condition must, according to Ruge, be looked upon as the starting-point of fracture of the vertebra. The spinal cord lies at the bottom of the torn portion, covered with blood. Ahlfeld (l. c.) has shown that even this serious injury may heal; the child lived for 9 days.

§ 921. Fractures of the *limbs* also are almost always in reality due to the detachment of epiphyses; and indeed, as Kustner has lately shown by experiment, a definite typical lesion usually accompanies definite manipulations. Direct fractures owe their origin to a force operating at some point in the course of the bone, and will then be situated at that spot.

Injury to the *clavicles* is the commonest lesion of those that belong to this category. Fracture may take place at any spot that is pressed upon, nor is any great violence required for the

¹ Many English text books of anatomy make no reference to these terminal epiphyses, which appear in the cartilaginous laminae above, and below the body of each vertebra, between it and the intervertebral substance. (T. Humphry, *The Human Skeleton*, 1858, p. 121; Flower, *Osteology of the Mammalia*, p. 18. (Tr.)

purpose. Such pressure is mainly exerted, when, in a pelvic presentation, the shoulder is pressed down, before the arms are released, or where the accoucheur passes his finger over the neck of the child with the intent of extracting the head. An indirect fracture may be produced in the median portion of the clavicle, when, in a transverse presentation, the shoulder is forcibly pushed up, a manœuvre which ought therefore not to be attempted, if the child is low in the pelvis. The usual cause however is compression of the clavicle lengthwise, or its flexion through the accoucheur compressing the shoulders, by forcing his hand in at the side. The bone then snaps at the junction of the middle and outer thirds, exactly on the inner side of the coracoclavicular ligament. The same cause may also lead to separation of the diaphysis from the inner, i.e. median, epiphysis; but this injury most often occurs in consequence of muscular traction, of excessive tension of the sterno-cleidomastoid muscle. It is therefore a common accompaniment of rupture and hæmatoma of that muscle.

Ruptures of the *humerus* are as common as those of the clavicle, and occur under several conditions. Where (a) the arm is carefully extricated by being passed across the face, the humerus will only be broken, if the finger acts directly on it, while both ends of the bone are fixed; the diaphysis will then crack, although of course this does not prevent one or other epiphysis being loosened at the same time. In cases (b) in which an arm lies across the back of the child (the flexed forearm lying behind the occiput), and is liberated by being rotated *outwards*, fracture of the diaphysis is rare. The typical injury then consists in separation of the upper epiphysis¹, and such separation is often so considerable that the diaphysis passes through the rent in the periosteum, which is situated exactly behind, and may even slip under the spine of the scapula. The upper epiphysis, during this excessive rotation, is so firmly fixed by the internal rotators and the capsule of the joint, that it will more easily tear away from the humerus or scapula, than be dislocated; so powerful is the capsular ligament. Where (c) the arm lies across the back and is liberated by being rotated *inwards*, fracture is not so common, owing to the attitude of the

¹ The diaphysis, with its rounded spheroidal end, is let into the epiphysis, as into a shallow socket.

shoulder being more favourable, and to the capsule being less severely stretched. But when fracture does take place, it is usually here also of the nature of an epiphysial detachment, accompanied by a tear in the periosteum at the axillary side, close to the small tuberosity. The upper end of the diaphysis, which has made its way through the tear, then rests as it does with dislocation into the axilla (*luxatio axillaris*). Fractures of the diaphysis and of the scapula are rare under these conditions.

These epiphysial detachments, accompanied by displacement of the diaphysis, are apt to be confused with true dislocations of the humerus, and are doubtless frequently mistaken for such dislocations, since these are excessively rare during labour. A constant symptom, in addition to gentle crepitation, is internal rotation of the humerus, due to the fact that the pectoralis major, the latissimus dorsi, and the teres major (all three rotating the arm inwards) are inserted into the diaphysis.

Little can be done for injuries to the clavicle, since it is scarcely possible to apply a permanent bandage. It is different however in the case of fracture of the humerus. Here the accoucheur may obtain complete union, if, as Fritsch (*l. c.*) recommends, he firmly binds the upper arm, after placing it in good position, to the thorax. Inasmuch however as in such a case some displacement is apt to remain, forming an obtuse angle (opening inwards) at the seat of fracture, elastic, well padded splints may be applied on the outer side of the upper arm and fore-arm, and on the inner side of the upper arm, these splints being fixed by bandages passing both round the arm, and round the arm and thorax. Union will be complete in between 2 and 3 weeks.

Injuries to the *scapula* are rare, but, when they occur, are probably produced by the practitioner releasing the arm of the child, by passing it across the back. They are of the nature of epiphysial detachments, and difficult to recognise.

The *femur* runs risk of injury, when (*a*) the practitioner presses upon it, in hooking down the groin; (*b*) through tension of the ligaments during rotation of the thigh, and lastly (*c*) when traction is exerted on the bone in the direction of its length.

The neck of the femur can scarcely be fractured, by pressure on the upper portion of the bone; it is almost too short for this.

Even a separation of the upper epiphysis is doubtless rare, owing to the diaphysis being deeply let into it. A fracture of the diaphysis is more probable under these circumstances. On the other hand, the lower epiphysis is readily detached, when pressure is exerted on the middle of the limb. A separation of the upper epiphysis is only likely, where the thigh is considerably *rotated*, or where, when flexed at a right angle, the limb is simultaneously strongly abducted. The periosteum then tears, and the end of the diaphysis, which has passed through the rent, lies as in the case of a pre-cotyloid dislocation. *Traction* in the longitudinal axis of the limb must be very severe, in order to produce an injury; but when it does, the lower epiphysis will be separated.

It is useless to apply an ordinary bandage, owing to the movements of the child, and to the necessity of keeping it clean. Crede¹ has therefore adopted the plan of simply binding the thigh upon the abdomen, by means of a napkin carried through the popliteal space. The treatment must be continued for 14 days, and is extremely successful.

Our knowledge in regard to fractures of the *bones of the leg* is very limited. They may doubtless be produced by traction, owing to the weakness of the epiphysial lines of union, particularly of the lower. Still more easily might they be produced by pressure and rotation, and consequently also during version, when the foot is brought down.

§ 922. From what has been said above, we should expect *dislocations* to be very rare, and as a matter of fact they are so, as was first shown by Gurlt (*l. c.*). In the case of the shoulder-joint, the epiphysis of the humerus is much too short to afford a *point d'appui* for the production of dislocation. The epiphysis would be detached, instead of dislocation occurring, and such detachment is further favoured by the firmness of the capsular ligament, and by its being attached within the limits of the epiphysis. The same is true of the hip-joint. But here dislocation is more apt to occur, when the epiphysis of the femur is made to bear the whole brunt of the operation, *i. e.* if very severe traction is exerted. The injury will therefore be most likely to occur, where the breech is extracted with a hook. Stretching and rupture of the ligaments of the joints of the

¹ *Vf. Verhandlungen der Gesellschaft f. Geburt. zu Berlin*, Part v., 1852, pp. 2-3.

limbs only happen at the elbow and at the knee, where great violence has been used. In the case of the jaw and sternoclavicular joints however, they are observed after a less degree of violence, and are consequently commoner.

Lastly, we must mention the separation at the ilio-sacral joint, the rupture of the sacro-iliac synchondrosis, which was first observed by Ruge. It may be explained by the great pressure and traction on the pelvis, that accompany extraction. This injury may possibly have an important bearing on the ætiology of oblique contraction of the pelvis.

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4. Forceps Operations.

§ 923. The *forceps* (*forceps obstetricia*, also called conservative cephalic forceps, by way of distinction from the toothed and crushing forceps, which were known to accoucheurs in olden times) consists of two metallic, spoonlike *arms*, which cross, but are united to one another. The arms are introduced separately into the parturient canal, and, when united, embrace the head like a pair of hands. The arm, which is introduced into the left side of the pelvis and with the left hand of the operator is known as the *left arm* of the forceps, the other, which he passes with his right hand, being called the *right arm*. Each arm is made up of the *blade*, of the *handle* and of the *lock*; the blade embraces the head, while the lock serves to unite the two arms, of which the right must lie over the left.

The invention of the forceps belongs to the 17th century, and to the English family of obstetricians called Chamberlen (fig. 131). Peter Chamberlen must have used the instrument as early as 1647; but we cannot state the exact year of its introduction, since the Chamberlens for a long time kept their invention a secret. We do know however that in the year 1670 Hugh Chamberlen, the son of Peter, offered to sell his instrument to the French Government; but he failed to do so, since after promising with the help of his instrument to terminate a labour, which Mauriceau wished to end by means of Cæsarian section, he was unable to fulfil his promise, even after vigorous attempts for three hours. Political troubles in England caused Hugh Chamberlen to flee to Holland, where he sold his instrument to Roonhuysen, who made further profits out of it, until at last, in 1753, it was made known under the name of *lever*. This however was only a part of the forceps, and even before this time Chamberlen's secret had become known in England, for as early

as 1733 Chapman mentioned the forceps, and in 1795 figured his own.

Meanwhile Jean Palfyn (1723), Professor of Surgery at Ghent, had brought under the notice of the Academy of Paris an instrument, which he called the "*manus Palfynianæ*" (fig. 132), and which he had undoubtedly constructed, without knowing Chamberlen's secret, although the latter may have given him the idea. By making known this, although very imperfect, forceps, Palfyn paved the way to further improvements, so that the honour of the invention belongs to him. Different forceps were now

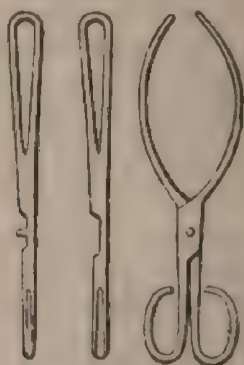


Fig. 131.—Chamberlen's forceps.



Fig. 132.—Palfyn's forceps.

invented in rapid succession; but the leading French and English obstetricians of the day, Levret and Smellie, did most for forceps operations, since they not only greatly improved the instrument, but also described its action more exactly, as well as the indications and manner of its use. Their forceps (figs. 133 and 134) became the models for all subsequent French and English instruments, and are characteristic of the principles of obstetrics, which until quite recently have been in vogue in those two countries. But the instrument and the operation have reached their highest development in Germany, by means of Stein

the elder, Boer, Ed. v. Siebold, Jörg, Busch, Brünnighausen and Nægele. The German forceps combine the best points in the French and English, and have now been brought to a degree of perfection that leaves nothing to be desired. All these forceps, whose authors have just been named, are equally useful, and a skilful accoucheur will be able to operate with them equally well. In actual practice however he will prefer the instrument with which he has been familiar since his student days. The best known forceps are the patterns of Nægele and Busch. I myself use the modification made by Trefurt (*cf.* his *Abhandlungen*, Göttingen, 1844, p. 141), which is in principle a combination of the instruments of Busch, Nægele and D'Outrepont (fig. 135).

The inventive faculty of the French has, especially during the last twenty years, given rise to a number of new forceps, in which however no improvement can be detected, and which possess no practical advantage. To the same category belong the persistent traction apparatus devised by Chassagny¹, and which is provided with pulleys; the aide-forceps of Joulin; the retroceps of



Fig. 133.—Levret's forceps.



Fig. 134.—Smellie's forceps.



Fig. 135.—Trefurt's forceps.

Hamon; the similar forceps of Cam. Bernard (the arms of which are simultaneously applied to the head from behind, are then slipped round the head and

¹ *Cf.* New Sydenham Society's Dictionary, "Forceps; Midwifery—Chassagny's persistent traction." (Tr.)

crossed, so that in the end they embrace the latter in the usual way): the *leniceps* (*leniter non fortiter capiens*) of Mattei, a plyingthing. Quite recently Turner has constructed a number of forceps, with the object of allowing direct traction to be made in the longitudinal direction of the blades, and parallel to the axis of the pelvis, and which were supposed to possess an index to point out the direction, in which traction should be made. For this purpose the blades are provided with traction rods, which run at a certain distance from the handles of the forceps, and serve for extraction, while the handles themselves merely act as pointers, and indicate the direction of the pull by their position relative to the traction rods (fig. 136). This form of forceps has been modified in many ways, particularly in England and America (Morgan, *British Medical Journal*, 1878; Simpson, *l. c.*; Lusk, *American Journal of Obstetrics*, 1880, *inter alia*).

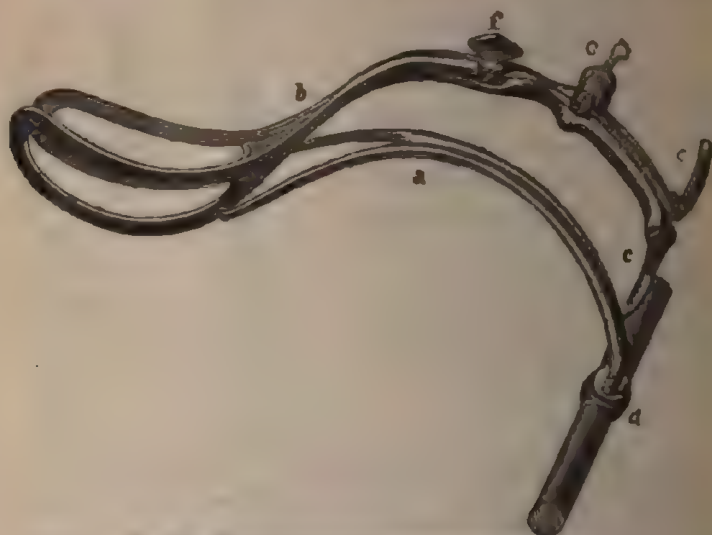


Fig. 136.—Turner's forceps (fig. 14 in his Monograph).

(a) Traction rods. (b) Blades. (c) Cross-bar, turned down. (d) Traction handle. (e) Compression screw. (f) Lock screw.

but in Germany it is but very little used. Kristeller (*Monatsschrift f. Geburtskunde*, xvii.) has added to the forceps a dynamometric arrangement, with a view of determining the traction force.

Simpson¹ has suggested the air-tractor as a substitute for the forceps (*cf.* Ed. v. Siebold, *Monatsschrift f. Geburtskunde*, vi., 1855, p. 101), an apparatus which consists of an hemispherical india-rubber shell, which projects somewhat beyond an internal small metallic or gutta-percha shell. It is first of all applied to the head, and emptied of air by means of an attached pump with piston and escape valve. By this means it is sucked on to the head, and then draws the latter out. The idea is theoretically good, but practically the air-tractor is useless.

¹ *cf.* Simpson's *Obstetric Works*, edited by Priestley and Storer, i., p. 498. (Tr.)

It is inconvenient to manipulate, unsatisfactory in its working, and detaches the scalp from the bones.

In the last place I must refer to the *rectis* (Roonhuysen), which played an important rôle during the last century, and which even now is occasionally recommended, and appears to be especially in favour with Belgian obstetricians. It is nothing more than a single blade of the forceps, and is a superfluous instrument; when used as a tractor, it is inconvenient, and when as a lever, it is dangerous.

Fillets too (*capitrolier*) were at one time used for extracting the head, and are frequently so still in England, especially by general practitioners. They are usually made of whalebone (*cf.* Westmacott, *Obstetrical Transactions*, xi., p. 177; Wilmot's fillet, *ibidem*, xv., 1874, p. 172).

§ 924. A good forceps must (1) be made of steel, which will not bend, although it may spring a little. It must everywhere be smoothly polished, so as not to injure the head, and to prevent septic matters collecting in any depressions.

(2) It must have an appropriate length, 40 cm. (15.75 in.) being the highest limit. A greater length is unnecessary, if the instrument, as I advise (*cf.* § 926, section 5), is only applied to the head, when lying below the brim, while on the other hand it renders the forceps unmanageable. Too short an instrument again will not always do its work, and moreover the lock will lie within the generative organs. The handles should on an average be 5 cm. (2 in.) shorter than the blades; where they measure the same, the handles will form the longer arm of the lever, and will be apt to compress the head too severely.

(3) The blades must possess a *cephalic* and a *pelvic* curve. The former must not be less than 7 cm. (2.75 in.) in width; indeed a somewhat greater measurement would, if anything, be safer, as rendering the skull less liable to severe compression, when the handles are pressed close together. Further, the widest portion must not be more than 7—8 cm. (ca. 3 in.) from the point of the instrument; where the distance is greater, undue compression of the head might occur, since during traction the head advances towards the point of the instrument, and the blades must then be firmly pressed together, to prevent the instrument from gliding off. Again, the more fully the head lies within the curve, the more room it will have for undergoing its normal rotations within the forceps. The points must on no account be in contact, when the handles are wholly closed. There must be a free space of at least 1½ cm. (½ in.), since otherwise the soft coverings of the head, which advance between

the ends of the blades, when the handles are closed, might be crushed during such closure. The pelvic curve (which was made known by Levret as "*la nouvelle courbure*", although it is said to have been invented by a surgeon in Chelmsford, Benjamin Pugh, 7 years earlier) begins at the lock, and gradually increases towards the point, so that when the instrument lies on a flat surface, its highest point rises 9 cm. (3.5 in.) above the latter. Instruments with a smaller pelvic curvature are only suited for extractions, where the head lies below the middle of the pelvis; indeed straight forceps may be used for operations in, or not much above, the outlet. (The perineal curve, which has been introduced into some forceps [Mulder, Froriep, Hermann], is superfluous).

(4) The greatest width of the blades, not far ($3\frac{1}{2}$ cm. = 1.4 in.) from the point, amounts to somewhat over 4 cm. (1.6 in.), and from there they gradually narrow towards the lock. The blades are usually fenestrated, in order to lessen the weight of the instrument, and to facilitate its close adaptation to the head. The rims of the fenestrie measure 1 cm. (.4 in.) in width; their thickness is greatest in the middle (4 mm. = .15 in.), and diminishes towards the margins. The latter must be rounded off.

(5) The handle must be so shaped, as to be conveniently gripped by the operating hand. The metal core is covered with a thick, perfectly smooth, layer of wood. The lower end is knob-shaped, while just above it a depression offers a convenient hold to the hand. About 1 cm. (.5 in.) below the lock, hook-like projections, with a concavity upwards, are added; they facilitate the closure of the instrument, and enable traction to be made upon them. Hooks &c. at the lower end are less desirable, since they may offer facilities for strong side to side swaying movements.

(6) The lock must be convenient, and at the same time reliable. In the German form (suggested by Nuegle and Busch), which possesses these requisites, one arm bites into the other, while a pin, which is situated on the left arm, and which again fits into a notch in the right one, effects the necessary fixation.

With the English lock (*cf.* Smellie's forceps, fig. 131), the two halves lie in contact, and fit into one another by oblique planes. This lock is easily adjusted, but lacks security. The French lock (*cf.* Levret's forceps, fig. 133) has the

opposite characters. There the arms of the instrument are superimposed and connected by a tenon provided on the left one, over which the mortise with which the right one is provided, must be brought.

§ 925. Forceps operations are intended to complete delivery in a manner which shall resemble the natural processes as much as possible, and preserve both mother and child from injury. *The forceps* is therefore in principle a substitute for "pains", and *affords a means of applying traction*. Such traction however cannot be exerted, without simultaneous pressure on the head, since otherwise the instrument would lose its hold. Further, the pressure will increase in proportion to the difficulty of the extraction, which increase, however undesirable, is unavoidable. This necessary pressure is quite sufficient to explain the rapidly injurious influence which the operation sometimes exerts on the life of the child, while on the other hand it is occasionally a reason for not even attempting the extraction. The results of forceps operations are in no way improved by this pressure. The reduction in the size of the skull which the instrument produces, is not uniform, but merely takes place in the diameter, which corresponds with the width of the forceps; and the complementary elongation of the head at right angles to that diameter (which, since the forceps grips the sides of the head, will be in the mento- or fronto-occipital, and also in a vertical direction) is, if anything, usually an obstacle to speedy success. To this must be added the fact that strong pressure interferes with the moulding of the skull within the parturient canal, and hinders the necessary rotations. At any rate the head must never be compressed with the forceps more than is absolutely necessary to its being firmly held.

At one time, although it is now a good many years ago, great expectations were founded on the compressing action of the forceps; indeed the effect of the instrument in accelerating labour was held to be proved by the circumstance that the handles gradually approach one another, as the head descends, even where they are at first far apart. But Stein the younger showed that this is merely a result of the change in position, which a head, when properly drawn upon, undergoes even within the forceps. The more the head is drawn down, the more also does it come to lie in the sagittal plane of the pelvis, and the

more exactly is the forceps applied in its shortest, *i.e.* transverse, diameters.

There are two ways in which *the forceps acts as a lever*. In the first place there is the unavoidable pressure which the instrument exerts on the head. Here the forceps acts as a double lever, each blade constituting a lever with two limbs, whose fulcrum (hypomochlion) is situated at the lock of the other blade. Secondly, the instrument may (if we regard it and the head as forming one rigid mass) act as a simple, curved lever relative to the parturient passages, and the usual traction may be assisted by *oscillatory* and *rotatory movements*, in which both the forceps and the head take part.

During such oscillatory movements, the side of the parturient canal, towards which the forceps moves, and towards which it is at the same time drawn, becomes the fulcrum. The weight to be moved acts at the point, where the blade of the opposite side lies against the vagina; the power is applied at the region of the handle, which is held by the hand of the operator. Thus the weight travels somewhat onwards, while the fulcrum remains *in situ*. If now the pendulum movement is made towards the opposite side, the position of the weight and fulcrum will be altered, and the other side of the head will descend. In this way both the forceps and the head gradually pass down. Rotatory are closely connected with pendulum movements. Indeed, as Kristeller points out, they are nothing more than a series of horizontal and vertical pendulum movements, which follow upon one another in a cycloidal manner, with intermediate transition movements. But while, in the case of pendulum movements, the fulcrum descends in a straight line on both sides, in the case of the rotatory movements this occurs in a spiral. The movements of a ring, which is so firmly applied to the finger that it cannot be removed by a simple pull, but only by being rotated and pulled to each side alternately, form a rough illustration of the pendulum and rotatory movements of the forceps.

There can be no doubt as to the utility of these leverage movements. Of course they must be combined with simultaneous traction, otherwise one side will ascend as much as the other descends. The fulcrum will only advance on traction. Rotatory movements are less efficient than oscillatory ones, and

at the same time decidedly more dangerous. They have however more effect in loosening the presenting part, and serve, where the position of the head is not accurately known, to point out the right direction in which to pull, viz. that of least resistance; but they can almost always be dispensed with. The oscillatory can overcome greater obstacles; but neither rotatory nor oscillatory, and this is specially true of the former, must be used needlessly or too freely, since, as shown above, they always bruise the vagina and especially the vulva, and may cause them to be torn through. I can only recommend them for extracting the head through the outlet and over the pelvic floor, in which case they are especially useful, where the genital fissure is narrow, and when, as sometimes happens, the head pushes out the lowest portion of the vagina in the form of a ring. Pendulum movements however must never be made in a sagittal direction, i.e. from before backwards, since this would involve great risk to the recto-vaginal and vesico-vaginal or urethral partition walls, more particularly as under those conditions the edges of the forceps, and not their broad surfaces, will furnish the *points d'appui* for the lever.

A further leverage action may be exerted, where the *forceps* is rotated round its long axis, and the position of the head thereby altered. This rotation however must never be extensive, since it involves a relatively great expenditure of force, and is then sure to be accompanied by grave contusion of the parturient passages, as well as by severe compression of the head and twisting of the neck. If moreover the head is not at the same time drawn further down, it will, after being rotated, return to its former position, since this latter is not a fortuitous hap-hazard one, but is determined by the existing space relations, and since the trunk does not rotate with the neck. Where on the other hand the rotation is accompanied by efficient traction on the head, such rotation will usually be superfluous, since it would occur spontaneously, much as happens when, after application of the forceps to a head that is lying obliquely and low, rotation results from mere closure of the transversely applied instrument.

I have never seen the forceps exert any *dynamical* action, i.e. assist in exciting or strengthening uterine contractions, if I except such contractions as occur after any strong mechanical

irritation of the genitalia (for instance after the introduction of the hand), and the occasionally increased activity of the abdominal muscles. Even this effect is usually absent, when chloroform has been administered.

§ 926. If the object of the operation, as stated at the commencement of the previous paragraph, is to be attained, the following conditions must be present.

(1.) The os must be completely dilated, or so yielding that there is no risk of bruising its edges, either during the introduction of the instrument or during the extraction. At any rate the os must be wide enough to permit the introduction of the blades, since otherwise its edges will be deeply torn, and any incisions that are required, will continue to tear, without the practitioner being able to prevent it. And even if the forceps can be introduced, without immediate damage being done, yet during the extraction, if the neighbourhood of the os is insufficiently elastic to allow the head to pass through easily, either the lower segment of the uterus will be dragged down with the head, or it will be extensively lacerated. Consequently, where the os is not fully dilated, the forceps should only be applied, when the head is small, and the lower segment of the uterus very yielding, and only on very distinct indications. There are of course some cases (e.g. eclampsia with premature labour), in which the operation may be called for under such circumstances; but they always require great manipulative dexterity.

In England, and still more in Dublin (Johnston, Atthill), a more frequent use of the forceps has lately been advocated, even where the os uteri is incompletely expanded. Johnston for instance applied the forceps once in every 10 hours, but his results are distinctly less favourable than with an expectant treatment, doubtless, as Barnes (*Obstetrical Transactions*, vol. 21, p. 121) rightly points out, for the simple reason that the imperfectly dilated parturient passages were unnecessarily bruised.

(2.) The vagina and external genitals must have become so much softened and so distensible, during the progress of labour, that they yield to the advancing head, at least sufficiently so as not to be extensively damaged.

(3.) The liquor amnii must have escaped, and the foetal membranes be retracted over the head. Otherwise the placenta might be prematurely torn from the uterine wall.

(4.) The skull must be sufficiently firm and not unduly large. Otherwise the forceps cannot seize it, and slips off. A hydrocephalic head, or one belonging to a highly macerated or very premature fœtus, or a head that has been perforated, as a general rule forbids the forceps.

(5.) The head must be in a position adapted to the use of the forceps, i.e. its greatest circumference must have traversed the pelvic brim. No doubt the most various opinions still reign in reference to this condition. Personally however I regard it as an indispensable one, since it is quite the exception for a head, which is still above the brim, to be correctly grasped; it is almost always seized in its sagittal diameter, and when so, is very apt to be gravely injured. And even if it happens to be seized in its transverse diameter, it can, owing to its abnormal mode of engaging, only be brought down with the greatest difficulty, and with disastrous results for mother and child. If the head lies firmly and fully in the brim, there need be less hesitation in resorting to the forceps, but even then the instrument should only be applied as an experiment. Only where the space relations are particularly favourable, will the desired result be attained; and unless the accoucheur is very experienced, he should desist from making the attempt.

For those cases in which the head lies high, Tarnier's forceps has recently been strongly recommended, since it allows traction to be made parallel to the pelvic axis, and such traction is mechanically more favourable and efficient than that made with the ordinary forceps, and since moreover the head can rotate more easily, when this form of instrument is used. But even if these advantages are admitted, the application of Tarnier's forceps to the high-lying or still movable head is not a trivial operation, either as regards mother or child. It certainly must not be practised to the extent that many advocate (Singer, *l. c.*).

(6.) The pelvis must be sufficiently roomy to allow the head to pass through uninjured (*c.f.* the next §).

§ 927. To recapitulate, the following conditions must be present, if a forceps extraction is to be fairly easy and safe. There must be no obstruction on the part of the cervix and vagina, the foetal membranes must be retracted, and the head must be of normal conformation, must be favourably placed, as regards the parturient canal, and must have reached the lower half

of the pelvic cavity. Under such circumstances, the operation will be indicated, when it is absolutely necessary that a labour be terminated, on account of some danger that is threatening the mother or the fetus, and when such termination cannot be brought about by any gentler means. This very general indication embraces all special conditions, which therefore I need not enumerate here. The above moreover is the only strictly scientific indication.

In actual practice however we meet with another indication, arising out of undue protraction of labour, the consequent exhaustion of the mother, and the danger which may be produced thereby. This latter indication is very indefinite, and offers plenty of room for the exercise of individual judgment. At the same time it is the one which gives rise to the majority of forceps extractions, of which by no means a few are solely performed, in order to shorten the period of suffering, or even to save the accoucheur time. Now it is undoubtedly true, as I have already (§ 527) had occasion to point out, that private practice makes demands and involves many considerations of its own, quite apart from purely clinical ones; so that we must not blame a man off hand, if he has applied the forceps merely with the view of sparing a woman some of the pangs of labour. But we have a right to insist that such operation of convenience shall be uninjurious, and that he who undertakes them shall both morally and mechanically have learned to control his hands and his instrument. Such, alas! is not always the case, and hence what is intended to be a benefit to the patient is not infrequently in reality the opposite¹.

Pelvic contraction is almost universally regarded as an additional indication, and I have already, in the "Pathology of Labour", laid down the conditions, under which the forceps may be used. Here therefore I shall merely again call attention to the fact that the forceps can only force the "strait", by exposing the life of the child to great risk, and by seriously damaging the maternal parts. The instrument cannot remove the pelvic obstruction, and can only very slightly reduce the bulk

¹ The records of the Lying-in Hospital of this town show that there is but rarely a real necessity for extracting with the forceps. Here amongst 4,864 labours (between 1865 and 1892), the forceps was applied 117 times, i.e. in about 2.4 p.c. of all deliveries, and even amongst this number the instrument was in a considerable proportion of cases simply applied *d'essai* *couper*.

of the head, while, owing to its doing this in a single direction (transverse), it generally gives the head an unfavourable configuration. Hence it follows that the forceps can only be used with benefit, where the head has already overcome the contraction, either through having traversed and got beyond, or through having become moulded and adapted to, it. Now under such circumstances delivery of course takes place spontaneously, provided there are good "pains". But if these are absent, or too sluggish, consistently with the well-being of the mother or the fetus, traction with the forceps may be a substitute. Unfortunately however it is not every medical practitioner who has sufficient knowledge and experience for estimating the mechanical relations of labour, and even the practised accoucheur may easily fall into error. Where therefore the accoucheur applies the forceps in a case of, or on account of, space disproportion, he should only use the instrument tentatively, and never with the intention of terminating labour with its help, cost what it may.

§ 928. The dangers connected with a forceps extraction, are slight, when the operation is performed under the above-mentioned favourable conditions, and where mere traction suffices for the delivery of the child. Under these circumstances therefore the prognosis may be pronounced good. Nevertheless abrasions and deep tears of the vagina and especially of the vulva are not uncommon sequela, more particularly in primiparae, who are most often subjected to the operation, and these injuries are for the most part more numerous and extensive than when solely due to the bulk of the head, than they would therefore be, if delivery were spontaneous. Again, they cannot always be attributed to a want of skill in the operator, for they may be produced both by the pressure of the broad ends, and still more by the edges, of the blades. Moreover the fact that the extraction has to be completed somewhat quickly, out of consideration for the fetus, usually makes it all the less possible to avoid them. These injuries usually heal rapidly, yet they must not be lost sight of, as is so often done by those who promote the entire freedom from risk of the various and forceps operations.

The child too as a rule suffers but little with an easy forceps extraction. But although spontaneous induction and subsequent of the soft parts are common, there are some cases in which the fetal parts are more or less injured by pressure of the

blades on the facial nerve, at the point where it passes round the edge of the lower jaw to the cheek (called paralysis of Landouzy, although first described by Dubois) always disappears spontaneously. On the other hand the compression of the skull, which accompanies even the easiest forceps operations, is apt to be fatal to the child in the way described in § 785, quite apart from the risk of the point of the blade causing death, by pressing on the cord which is coiled round the neck, or on the larynx or cervical blood-vessels¹ of the child. These facts explain how it is that the mortality of the children is comparatively high, even with the simplest forceps operations².

The operation is more dangerous, both for mother and child, the less perfectly the conditions for its easy performance are fulfilled. The longer the operation lasts, the greater the expenditure of force required, the less that simple traction suffices, the worse does the prognosis grow. The mother runs an increasing risk of the cervix being rubbed through, of the vagina and the neighbouring cavities being damaged, of severe bruising followed by sloughing, of the formation of cicatrices and fistulae, of contusion of the pelvic connective tissue and nerves, of rupture of the joints and fractures of the pelvis, and of extensive perineal tears. The head of the child on the other hand, owing to the severe general as well as localised compression, to which it is exposed, will be liable to have its coverings torn, to curvatures and fractures of the cranial bones, to intra-cranial effusions of blood, and to injuries of the eyeballs and parts of the face: injuries which however are rarely directly due to the instrument, but generally arise indirectly from the contraction of the parturient canal, through which the head is rapidly extricated. If the risk of these sequelae were borne in mind, by every accoucheur who undertook a difficult forceps operation, he would at any rate avoid causing those injuries which are the result, not merely of a want of skill, but of unpardonable carelessness and stupidity, such as the perforation of the vaginal fundus by the blades of the forceps, the inclusion and detachment of the lower segment of the uterus, the seizing and tearing off of the vesico-

¹ Cf. Hecker, *Klinik d. Geburtshilfe*, ii., p. 187.

² According to Poppel (*Monatsschrift f. Gynäkologie*, xxv., Supplement, p. 43), the mortality amounts to 11 p. c. In my *Clinique* where, as already mentioned, the operation is only performed, when urgently indicated, the number of children which perished after the operation, has amounted during the last five years to 17 p. c.

vaginal partition wall, which has been gripped by the points of the forceps (I know of a case where this wall, through being moderately prolapsed, was entirely torn off, from the fundus vaginæ to the lowest part of the urethra, and in which therefore an incurable vesico-vaginal perforation was produced), the passage of a blade into the anus, or its introduction into the vagina with the point directed backwards!

Operation.

§ 929. The operation is most easily performed in the complete or incomplete lithotomy position. Wherever there are difficulties, or even where the perinæum seems in danger, the lithotomy position, at least the semi-, should be used: it alone allows the perinæum to be kept under proper supervision. The ordinary position in bed should only be retained, where the head lies quite low, and where there is no need to depress the handles of the forceps. The operator in that case stands at the side of the parturient woman, or else operates over the foot of the bed; but even then it is well to raise the sacrum by pillows, before beginning, in view of the extraction of the trunk, which may eventually prove necessary. The lateral posture has no advantage whatever, and on the other hand is very inconvenient, especially during the last stages of the extraction, when the handles of the forceps need to be well raised towards the abdomen.

The operator should be careful to see that the *bladder* is empty. An extraction while that organ is full, would be apt to injure it, while on the other hand the urine cannot always be drawn off during the operation, since the head that is being drawn down, may press upon the urethra.

Chloroform should always be administered, unless there are distinct counter-irritations, since it immensely facilitates the operation. It keeps the woman quiet, and enables the operator to perform all his manipulations as leisurely, safely, and quickly as on the dummy. One intelligent assistant (*e.g.* the nurse) will be sufficient. She must support the woman, separate her thighs, and, if necessary, for a short time hold the blade that has been introduced first. The operator needs no other assistance, since he can give the chloroform just before beginning the operation, after having got everything ready. Before actually

introducing the blades, he should once again make a careful examination of the situation and position of the head, as well as of the condition of the parturient parts, so that he may be perfectly familiar with all the existing conditions. The forceps must be warmed with carbolised water, and smeared with carbolised oil, before being used.

§ 930. The operation consists of two acts, which are almost entirely distinct: the application of the forceps to the head, and the extraction of the latter. The following are *general rules*:

(1) Since the pelvic curve of the forceps must correspond to the pelvic axis, *the blades must lie in the transverse diameter of the pelvis*. Where the head is low, it is a simple and easy matter to introduce the blades exactly at the sides of the pelvis. But when the head is higher, or when its position is abnormal, the proceeding is often difficult, and then the best plan will be to introduce the blades just in front of the sacro-iliac articulations, where there is most room, and afterwards to bring them round to the sides by gentle leverage and rotatory movements. Such difficulty arises, where the head is high and lies transversely or obliquely, whether the vertex or the face presents; sometimes also with an after-coming head, or where the edges of the os are not wholly retracted, in which case the blades may be most safely (*i.e.* with least risk of including those edges) introduced just in front of the posterior bays of the pelvis. If the operator finds it difficult to carry the blades round to the sides, he may venture to lock the instrument in a semi-transverse or semi-oblique relation to the pelvis; but if so, when the head has progressed, he must always, and as soon as possible, re-apply his instrument transversely, and with its point directed anteriorly. The blades must never lie in, or even nearly in, the sagittal diameter, since under such circumstances the soft parts would almost inevitably be bruised.

(2) Since the object of the operation is to exert traction and not pressure, *the forceps should*, whenever possible, *seize the head in its transverse diameters*. This however has already been shown to be only possible, when the head lies low. Under other circumstances one blade will be applied to one side of the forehead, the other to the opposite side of the occiput, and as soon as the position of the head has grown more favourable, the forceps will of its own accord come to lie properly. Occasionally

however, as has already been stated, it may be desirable on account of the position of the head to lock the forceps in a direction which is semi-oblique in reference to the pelvis.

(3) The left blade is applied first, since the second must always be introduced above the first, and when the instrument is locked, the right always passes over the left. Only where the position is unfavourable, where a limb is prolapsed, or where the head is more closely pressed against one side of the pelvis than the other, is this rule departed from, and that blade introduced first, which corresponds with the side on which there is least room between the head and the parturient canal, and where therefore the greatest difficulty is anticipated. If the right blade has been introduced first, *the handles must be crossed* before the instrument is locked; for this purpose the left handle is first carried over the right towards the left side in a sharp curve, and then again under it back to the right side of the mother. Only where the head lies very low, can the left blade sometimes be passed in beneath the right one, where this latter has been introduced first; the assistant must meanwhile well raise the right handle.

(4) *The operator should hold the handle in his full hand*, with his thumb lying on its inner surface, while the other fingers are distributed over the outer surface near the lock. This grip combines great security with ease of manipulation and free mobility of the hand in all directions.

(5) When the head is low, 2 fingers, when higher, 4 fingers of the free hand are to be pushed up between the head and the walls of the parturient canal, if possible as far as the os, so as to prepare the way for the instrument, to give it the best direction and position, and to keep the internal parts from being seized at the same time as the head. If the tips of the fingers do not reach sufficiently high, the point of the blade must be pushed cautiously along the head, without ever leaving it. All violent or jerky pushing must be avoided. If any obstruction is encountered, the point of the blade must be drawn back, and then be pushed on again in a somewhat different direction. When necessary, the whole hand may be introduced, in order to remove, or to protect, the obstructing object.

(6) While the blades are being introduced, *both the pelvic and the cephalic curves must be simultaneously followed*. Consequently

each blade must at the same time be moved forwards from above downwards, and from one side to the other, and thus describe the double curve. In this way alone can the necessary and uniform adaptation of the blade to the head be secured, and the point of the instrument be prevented from boring into any part of the latter. The blade is first of all passed into the vagina over the fingers, while the handle is held almost vertically, with a slight inclination towards the inguinal region. The concavity of the blade being now pressed firmly against the head, the blade itself is pushed on, until it rests horizontally, the handle being brought down along the thigh of the woman. In the new place the handle is moved to and fro between the thighs, in order to carry the blade round the head; finally the handle is depressed to the extent required by the high or low position of the head. The thumb of the hand, which is lying inside the generative tract, should meanwhile be kept applied to the lower edge of the blade; it guides the latter, presses it evenly upon the head, and prevents its slipping off backwards.

When the second blade is about to be introduced, the assistant passes his hand beneath the thigh of the woman, and steadies the handle of the blade which is already *in situ*, i.e. unless the operator finds it more convenient to allow that handle to rest in the palm of the hand which is lying within the vagina.

(7) As soon as both blades are in good position, the instrument may be locked, the two parts of the lock being fitted into one another by a gentle lowering of the handles. *If the blades have slipped, i.e. if the two handles are not parallel, one of them is taken in each hand, the thumbs are placed on the projections beneath the locks, and the handles thus brought into parallelism.* If however this is found to be very difficult, one or other blade must be pushed along the side of the head, or else one or both blades must be removed, and again introduced in a better position. Violence must be carefully avoided in bringing them parallel; it injures the skull and severely bruises the parturient canal. If one handle projects further from the vulva than does the other, either one must be pushed in or else the other must be pulled out, as happens to be required. Care should be taken in locking, not to include hairs or folds of the vulva in the lock. (I have seen 2 cases in which an apron-shaped nympha was torn off).

After locking the instrument, a *cautious pull* may be made to ascertain that the instrument lies properly, and has a good hold. If the result is satisfactory, two fingers may be slipped over the projections attached to the handles, and a slow pull exerted, while the fingers of the other hand are passed into the vagina above and below the forceps, in order to determine the relation of the instrument to the vagina and head.

§ 931. (8) *In beginning to extract*, the operator places several fingers of his right hand on the projections at the lock, or else his whole hand grasps the latter in such a way that four fingers lie on the right, and the thumb on the left side of the forceps, his left hand meanwhile being applied to the excavation at the lower end of the handles, and holding the latter together. The left hand may, if necessary, make an examination during the operation, and assist in guarding the perinæum. While pulling, the accoucheur should keep his arms close to his chest, and mainly draw with his hand and fingers, much as is done in the case of the reins during riding. He must never pull with the whole weight of his body.

The pull itself must be steady and straight. Pendulum and rotatory movements have already been referred to, and should only be resorted to in exceptional cases. A series of separate pulls or pendulum movements, which gradually increase in force, is called a *traction*. The strength of the pull must be entirely regulated by the existing resistance; but the operator will do well to start by using but little force, so as not too soon to exhaust his supply. He should also bear in mind that, although the operation appears to require force, the proverb "*non vi, sed arte*" is eminently applicable. The rapidity of the extraction must depend on the indications. If there is no cause for hurry, it is well to pull during the spontaneous pains, or during such as are provoked by friction; or at any rate natural labour may be imitated by allowing suitable intervals, and by gradually increasing the force of the pull. On the other hand the operation must not be done too slowly, since, as we know, the child always suffers, when its skull is compressed. Where therefore the operation is slow, the pulse of the fetus must be constantly watched. During the intervals between the periods of traction, any progress that has been made, must be maintained by a firm pull on the handles; this moreover will

assist in moulding the head to the fresh pelvic planes which it has reached.

(9) *The direction of the pull must correspond with the axis of the parturient canal.* Where therefore the head is high, the direction must be downwards and somewhat backwards, and remain so, until the head has descended to below the middle of the pelvis. The direction must then be changed to forwards and downwards, until the presenting part has got well beneath the pubic arch. While the foetus is passing through the pelvic outlet, the line of traction should be forwards; and while the perineum and vulva are being crossed, forwards and upwards. At last it runs directly upwards, so that after the exit of the head the handles are vertical, and almost in contact with the abdomen of the mother.

(10) Special care is necessary, while the head is traversing the *perineum*, and, if possible, that region should be directly guarded with one of the hands, that has hitherto been applied to the handle. If the head is carefully steered, and temporarily delayed, should, as is not unusual, the uterine contractions happen at this period to be very violent, if the head is extricated over the perineum during an interval, and the edges of the vulva are stripped back, the perineum may very generally be preserved, indeed often even better than if the person concerned was naturally confined. But all this only applies, when there is no need for hurry. It is never advisable to remove the instrument before completing the extraction, with a view to saving the perineum. Where delivery is urgent, such a step is inadmissible, while, on the other hand, if there is plenty of time, the forceps may actually assist in preserving the perineum, as already mentioned. Further, it is very unpleasant for the accoucheur, as regards the unprofessional by-standers, to seem to leave the operation incomplete, especially when the head does not speedily emerge after the removal of the instrument.

(11) When the head is born, the hand which till then has been pulling, is advanced over the lock, and grasps it loosely with thumb and fore finger, the middle fingers being passed between the blades. By this means the blades are separated, so that they can be removed.

(12) When it is necessary to remove the forceps, before delivery is complete, the lock must first of all be opened. The right arm

of the forceps is then taken in the right hand, and drawn out of the parturient passage in the same direction as that in which it was introduced, the left hand meanwhile lying upon and supervising the perinæum. The left half of the forceps may next be removed with the left hand in a similar manner.

Special Directions.

§ 932. These are required, where the head occupies some unusual position.

We have already dealt at sufficient length with those cases in which *the head lies high*, when referring to the position of the blades relative to the pelvis and head, and also when speaking of the direction of traction (§§ 930, 931).

(1) *Vertex presentations, in which the occiput has rotated backwards* (3rd and 4th positions). No violent attempts must here be made to rotate the occiput forwards. When there is difficulty in extracting the head, all attempts at rotation will be useless, or will, to say the least, be accompanied by grave risk, both of twisting the neck and of bruising the parturient passages; the difficulty arises from mechanical conditions which cannot be got rid of. On the other hand where there is no difficulty, violent efforts are uncalled for. As was shown in § 170, where we described the mechanism of the exit of the head, the occiput must be brought down along the posterior vaginal wall and out over the perinæum, the forehead and face then being extracted beneath the anterior pelvic wall. If therefore the occiput is still relatively high, above the pelvic floor, the pull must be made horizontally with a slight inclination downwards; when the occiput has reached the perinæum, the direction is changed to forwards and upwards until the point of the occiput has passed the posterior vulvar commissure. If the handles are now well depressed, and gentle traction is exerted downwards, the head will be extended and the face born; indeed the latter frequently makes its exit spontaneously, when once the occiput has been extracted. The handles of the forceps should be firmly gripped, while the direction of pull is being changed, so that the blades may remain *in situ*, and not slip to and fro over the head; gentle pendulum movements may

here be very useful. The perinaeum must be carefully supervised, while the occiput is being extricated.

(2) *Cases in which the head is low in the pelvis, but lies obliquely or transversely.* Where the head lies obliquely, the instrument must be applied in the usual way, i.e. at the sides of the pelvis. Frequently indeed the introduction of the first blade suffices to push the head towards, and into, the sagittal diameter. But when not, such improvement in the position may still sometimes be brought about, at the time that the forceps is locked; and if this too fails, the forceps will of its own accord grasp the head at its sides, and a little obliquely in regard to the pelvic canal, and unaided move into its natural position, when the head is drawn out. Artificial rotations are not required.

Where the head really lies *transversely* (§ 171), the blades must on no account be applied at the sides of the pelvis, unless indeed the head is very small, compared to the size of the parturient canal. With vertex presentations, one blade would lie over the forehead and face, while with a face presentation it would lie against the lower jaw and neck. Under such circumstances the forceps should from the first be applied in an oblique diameter of the pelvis, in such a manner that, when locked, the concavity¹ (see the point) of the blades is directed towards the part which should rotate forwards. The posterior arm of the forceps is first passed up in front of the ischiadic notch, and sometimes this of itself causes the head to assume an oblique direction. If not, the other arm is introduced directly in the antero-lateral region, and this too tends to improve the position. If the head is firmly fixed, and there is but little room, the anterior blade, whichever it happens to be, may be passed in first, since it is then always the most difficult to apply. As soon as the instrument is locked, an attempt must be made to bring the head well within the cephalic curve, but no force must be used in doing so. During the succeeding traction the instrument may be gently turned round its longitudinal axis, so that its concavity looks more and more forwards; but this must be done gently. If then the head has been brought into an oblique position, the blades may be loosened, and, guided by two fingers, be applied to the sides

¹ By this Spiegelberg means, I think, the concavity formed by the pelvic, as opposed to that formed by the cephalic, curve of the forceps. (Tr.)

of the head. The instrument is then locked, and the head extracted as above described.

(3) With a *posterior parietal presentation* (§ 172), the forceps should not be applied, when the head has only partly engaged in the pelvis. The operator should wait, until he has been able, by means of external pressure, so to improve the position that the head can be seized fully, and even then the instrument is only to be applied tentatively. The external pressure must not be relaxed during the traction, indeed not until the head has engaged in the pelvic cavity in a better position. If the forceps is applied, before this rectification is effected, it will glide off, even where its application has succeeded, since only the half of the skull which is directed towards the promontory can be grasped; or else, if the blades are prevented from slipping off through firm compression of the handles, the skull will be injured with the points of the forceps, and the anterior wall of the parturient canal will be subjected to a severe dangerous bruising, without the object in view being attained. In other words another mode of delivery will after all have to be resorted to. Where the *anterior parietal bone presents*, a forceps operation is quite out of place, since here no simultaneous manual assistance towards rectification of the position is possible. Moreover this position is even more exclusively confined to cases of pelvic contraction than is the presentation of the posterior parietal bone.

§ 933. (4) *Face presentations*. If the accoucheur is called upon to deliver in a case of face presentation, where the face is low and the chin has rotated forwards, he will not find it difficult to apply the forceps and extract. But when the instrument is locked, the handles must run straight forwards, so that the blades may on either side lie in the fronto-occipital direction, i.e. at the temples and at the occiput. Traction is then to be applied forwards and downwards, until the chin emerges, and in order to effect this completely, it will frequently be necessary to strongly depress the handles, the perinaeum being at the same time carefully watched. As soon as the chin has been extricated from beneath the anterior pelvic wall, the handles are to be steadily raised, so as to extract the forehead &c. over the perinaeum, which may not run any special risk, if the instrument is properly managed.

If however the axis of the face is still somewhat oblique, it will be more difficult to apply the forceps. The best plan is then to

begin by applying the blade, which has to pass in behind the chin, *i.e.* the blade which belongs to the posterior hollow of the pelvis. This will, when the second blade is applied, tend to fix and rotate the chin forwards; so much so that, when the instrument is locked and pulled, rotation is sometimes easily and almost spontaneously completed.

The forceps is not well suited for labours in which *the face is still high*, since the latter will usually be lying transversely, or else the chin will be directed backwards. In the first case, the forceps seizes and crushes the neck, inasmuch as, when the face is high, the instrument can never be applied with certainty and gentleness in an oblique diameter of the pelvis: in the second case, it prevents the necessary rotation of the chin forwards, owing to the very firm hold that must necessarily be taken.

With a *mento-posterior position*, the forceps is not a conservative instrument, even when the face is at the outlet of the pelvis. The skull will be fractured, and the parturient passages bruised, since the long mento-occipital diameter would be obliged to rotate between the pubic bone and the sacrum (§ 176). Cases however in which the head is so small that there is no obstruction, might form an exception to the rule.

(5) *Brow presentations.* Here a similar procedure to that recommended in cases of face presentation, will be required. The handles pass forwards and downwards, and traction is applied in this direction, until the forehead has been brought into the vulva, and the region of the upper jaw is located behind the pubic symphysis. The occiput is then raised up from the perineum, and the parts of the face finally extracted from beneath the anterior wall of the pelvis, by well lowering the handles. This will only be found easy, where the head lies sagittally or nearly so, and where the space relations are favourable. Under all other circumstances the forceps should merely be used tentatively (*cf.* §§ 180 and 181).

(6) *With an after-coming head* (§ 915). Here the blades may be passed in above, or below, the trunk, but in either case *the instrument must be locked beneath the latter*. The reasons are: first, that where the forceps lies on the child, it is impossible to seize the mento-parietal *sc.* -occipital diameter, as must be done, but merely the suboccipito-frontal; and secondly, that if an

attempt were made to extract in that position of the forceps, the handles could not be depressed, without a risk of seriously bruising the child. It is a good plan therefore always, and from the first, to apply the instrument below the child, a recommendation which also holds good for cases in which the face is directed forwards. During the introduction of the blade, an assistant should raise the trunk of the child (which has been covered by a cloth), and hold it somewhat towards the opposite side, care being taken to avoid including the cord, a hand or an arm of the fetus. The blades must not lie in the cervico-frontal, but, as already mentioned, only in the mento-parietal or -occipital diameter. Otherwise the edges will project, and cut into the posterior wall of the parturient canal, and it would be difficult for the necessary flexion of the head to take place. The direction of the traction must depend on the position of the head. If the child is living, the operation must be performed quickly, if its life is to be saved.

§ 934. (7) *Slipping of the forceps.* Occasionally in the course of traction the blades slip off the head, and, if the operator continues to pull, emerge from the vagina empty. This slipping may be the result of the head not having been gripped fully, but only in one segment, *i.e.* only with the edges of the forceps, and, when traction is applied, escaping forwards or backwards out of the cephalic curve—*horizontal slipping*. Or else the blades may glide down along the head, owing to the latter only being gripped by the points of the instrument, or owing to the latter finding no *point d'appui*, in consequence of a want of firmness in the head—*vertical slipping* (Lachapelle). These conditions may lead to injury of the skull (especially if the operator continues to press the handles together, after the forceps has partially slipped off), and to lacerations of the parturient passages. Indeed if the instrument slips off unexpectedly, the accoucheur may tumble over backwards!

This slipping may be recognised by the advance of the instrument, and by the appearance of the blades unaccompanied by the head ("the forceps grows longer"); also by the divergence of the handles and by a sense of the arms of the forceps having become very elastic, as well as perhaps by a cracking of the cranial bones. As soon as the operator becomes conscious that his instrument is leaving the head in one or other direction—and if he regularly examines during the tractions, as he should

do, he will soon discover the slipping—the lock must be opened, and each blade pushed on in the appropriate direction. Or else the instrument may be taken off, and re-adjusted, unless indeed the slipping that has occurred, has shown that the case is not suited to the use of the forceps.

The above directions may serve as guiding principles, to which the accoucheur may, broadly speaking, adhere. In any special case however, if he is familiar with the general rules, and above all is thoroughly conversant with the mechanism of labour, he not only may modify them, but is often obliged to do so. In conclusion, I must add that nothing can be more dangerous than to force an instrumental extraction. True to the principle that the forceps must never be injurious, the operator should immediately abandon its use, as soon as it ceases to be safe.

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5. Perforation and Extraction of the Head of the Fœtus— Craniotomy.

§ 935. This operation consists in opening the cranial cavity, evacuating its contents (*excerebration*), and immediately afterwards drawing out the mutilated head. The resistance which the head, while still entire, presented, owing to the disproportion between it and the parturient canal, is thus got rid of, so that the labour can be terminated without injury to the mother.

The reduction of the size of the fœtal body, and especially of the fœtal head, is a very old operation, which is referred to in the writings of Hippocrates. Indeed for centuries it remained the only resource in difficult cases; and although in the earliest obstetrical writings it is expressly limited to dead children (Hippocrates, Celsus), yet this rule was soon abandoned, partly because the life of the child was thought of no account, partly because no reliable signs of the child still being alive were then known. And in truth, before the days of podalic version, forceps

and Cæsarian section, what alternative remained to the accoucheur, unless he chose to remain an idle spectator?

In those days therefore the whole art of obstetrics consisted in destroying the child, a fact which explains why the terms *embryuleia* (lit. extraction of the child) and mutilation were equivalent, and even nowadays the last operation is spoken of as *embryuleia*. The only instruments used, previous to the middle ages, were knives and daggers for opening the cavities of the body and detaching limbs, or else sharp forceps and hooks for extracting the mutilated fetus. The introduction of the operations which have been described above, and the resulting reconstruction of the principles of obstetrics have restricted *embryuleia* to its proper place. Indeed some obstetricians, going to the other extreme, have wished to banish perforation as an unnecessary or indeed degrading operation, and to exclude it from the number of eligible methods (Osiander); and even leading accoucheurs, although they did not go quite so far as their colleagues just referred to, have declared that perforation should never be performed, where a child was obviously alive—a principle which the majority of French and German accoucheurs accepted, on the ground of aesthetics and humanity, although the latter is only apparent. The more practical English obstetricians never went to this length. They held fast to the principle that the child must always be sacrificed, where the question lies between its life or that of its mother. And this is the stand-point which is accepted to-day. Perforation of a living, as of a dead, child is a justifiable measure, when necessary. With our present knowledge however of the mechanism of labour under normal and abnormal conditions, we can say more exactly than our forefathers could do, when such necessity really exists. More than this, we have means of performing the operation, which, when rightly employed, render it free from danger.

§ 936. *Perforation is indicated, where there is insufficient room for the delivery of the child, when the interests of the mother require that she be delivered, and when perforation is the safest way of attaining that object.*

This general statement needs some explanation, although the principal points have been referred to under "Pathology of Labour," especially in the part devoted to "Contracted Pelvis" (§§ 532—536).

It will be obvious that the *lower* limit at which perforation is admissible, begins at the point at which delivery *per vias naturales* becomes absolutely impossible (§ 506), a condition which obtains, where the shortest diameter measures 55 mm. (2.25 in.). Where the pelvis is still more contracted, it will only be possible, in quite exceptional and favourable cases and with a large experience, to extract a foetus, without seriously injuring the mother. The *upper* limit on the other hand cannot be fixed. Where there is moderate contraction, the proper course to be pursued depends on so many other factors in the mechanism of delivery, and especially on whether the foetus is alive or dead.

If the child is dead, perforation may be resorted to without much hesitation, wherever there is want of room, and as soon as labour does not progress satisfactorily as regards the mother; again, where delay diminishes her prospects, and where there is reason to foresee that the forceps will injure the parturient canal. It may be more æsthetic both for the medical man and the unprofessional by-standers to witness the birth of an uninjured child; but the one duty of the former is to care for the mother, and it is certain that she does better with perforation, with which the forceps may be combined, than with the latter alone. Where the child is dead, version must only be resorted to, when required on account of some presentation or position of the head, which would make it difficult to perforate.

If however the child is alive, the proper treatment of the case alters at once. We must now do everything in our power to save it, while still adhering to the principle referred to in the above indication. In any particular instance the ultimate decision must of course be based on the view which the medical attendant, after considering the existing conditions, has formed as to the relative risk, both for child and mother, involved in waiting longer, in making an attempt with the forceps and in turning. Indeed that decision is sure often to vary with different accoucheurs, according to their previous experience and the technical dexterity which they have acquired. Every practitioner must act according to his own convictions, and we must bear in mind that it is not the frequency with which a man perforates that decides the value of his obstetrical principles, but the results which he attains: the number of mothers whom he has safely steered through the dangers of parturition, and the

number of children that have survived the first days of child-bed. The results of forceps extractions and of version in cases of pelvic contraction, even where children have been delivered alive by means of the operation, bear a very different aspect from the children's point 14 days afterwards. And even what is real gain in fetal life is not uncommonly loss in regard to maternal life.

Supposing now that the accoucheur feels convinced that delivery is essential to the welfare of the woman, and that version and forceps are very questionable and serious measures both for her and for the child, his choice lies between excerebration and Cæsarian section. If the parturient woman has already suffered so severely from the effects of the labour, that the success of the last-mentioned operation is *a priori* very doubtful, this may straightway be excluded, and perforation undertaken. Under opposite conditions the decision must depend on the consent of the parturient woman herself. If she declines to expose her life to a great risk for the sake of her child, and she has the right to decline, perforation must here also be performed.

In both cases the operation should be done immediately. No prospect remains of saving the child, which should therefore be looked upon as dead. Delay is useless, so far as it is concerned, and moreover is injurious to the mother. The unpleasant sensation of destroying a living child must not be considered for a moment. Sentiment is quite out of place. It is the judgment of the accoucheur which must decide his course of action. His one duty is to help, and to let his hands lie idle merely in order to avoid wounding his feelings, is inhuman and unconscientious. Even the advice, which is sometimes given under such circumstances, that he should make one more attempt with the forceps, before perforating a living child, simply in order to guard against the possible accusation of having unnecessarily destroyed the life of a fetus, is bad. These attempts, when made in cases where perforation is required for the benefit of the mother, convert such benefit into the opposite.

§ 937. The line of treatment, which has just been advocated, is, I need hardly add, based on the assumption that perforation, especially in the case of a living child, is a conservative operation as regards the mother. And this it actually is, provided that the operation is undertaken in good time, is soon

followed by extraction, and that both operations are properly performed.

The reason why the mortality after the operation is still very high, arises mainly from its being performed too late, that is if we except bad methods of extraction, and the injuries and septic infection to which they lead. If the parturient woman has been exhausted by an unduly prolonged labour, or if the lower segment of the uterus and the vagina are bruised and sloughing, in consequence of futile attempts to extract with the forceps, or if septic infection has occurred, the result cannot as a general rule be favourable. But such a result must not be attributed to the preceding perforation, but to the fact that the above-mentioned sequelae were permitted to occur. The moral is that *perforation should be done early, while the parturient passages are still healthy, where we have the choice*. I admit that it is by no means easy to fix upon the correct time. The absolute duration of labour is a most misleading basis to go upon; it is better to be guided by the opinion that further delay will be useless to both parties concerned, and that all other modes of delivery will probably be more injurious than perforation. And such a conclusion can usually be arrived at early. If only the practitioner thoroughly understands the course of labour in the various forms and degrees of contracted pelvis, he will be able to give good reason why in one instance he remains an idle spectator for hours, while in another he very soon proceeds to perforation. But in any case this operation is called for, in the conditions in question, as soon as the parturient woman shows signs of commencing illness: fever, œdema of the vulva, dryness of the vagina.

In the Maternity here, during the five years from 1865—70, 13 late perforations were performed, with 7 deaths. During the last 12 years, on the other hand, in which the operation was usually performed in good time, only 9 out of the 58 women, whose fetuses were perforated, died. Moreover out of these 9, 3 were so distinctly suffering from primary septicæmia, that the unfortunate issue had obviously nothing to do with the operation; 2 others were brought in from the out-patient department some time after the rupture of the membranes, and they also may have already been infected; in 2 others, attempts to deliver with the forceps had preceded the perforation.

To prevent any possible impression that I favour unnecessary perforation, I may remark that out of more than 160 cases of excerebration which have been undertaken in the in- and out-patient departments during the years 1865—1882, almost $\frac{3}{4}$ of the operations were performed in women whose pelvis was generally contracted, and half the pelves belonged to the 2nd and 3rd degrees of

contraction (where the conjugata vera measured 8·5—7, and 7—5·5 cm. = 3·25—2·75, and 2·75—2·25 in.); and we know that cases of general pelvic contraction are not so very common, compared to simple flat pelvis. A further proof that want of room was mainly the cause for interference, is found in the fact that almost $\frac{3}{4}$ of all the labours were those of boys, and about half the women were primipare; and yet the condition of the uterus and the pains are on the whole more favourable for the spontaneous termination of labour in primipare than in multipare. As regards abnormalities there occurred 2 presentations of the face, 5 of the brow and 16 of the posterior parietal bone.

§ 938. A further condition for the success of perforation is that *extraction shall soon follow*. This however is opposed to the view of many obstetricians, who regard excerebration merely as a preparatory operation, at the end of which, unless there are special reasons for hurry, the pains are to be allowed to expel the now non-resisting skull. They place excerebration on a par with version, which is only followed by extraction, where there are definite indications. I accept this analogy, since, as I have said before, a difficult version or one which has been performed, where labour has been protracted, should in my opinion be immediately succeeded by extraction of the fœtus. Moreover the conditions which are usually present in cases of perforation are almost invariably such that there is no prospect of benefit from an expectant treatment. My special reasons for combining perforation and extraction are the following:

(1) The expulsive powers are frequently inadequate for the rapid expulsion of the perforated skull, partly because the latter is not always sufficiently compressible even after the perforation; because even if it is, its position is an obstacle; and lastly because strong pains are frequently absent, in the circumstances under which excerebration is required.

(2) If the parturient activity is considerably prolonged after perforation, it almost invariably proves injurious to the parturient woman, partly because the operation is so frequently practised at a time at which she has already been seriously injured; partly because the brainless fœtus usually undergoes rapid decomposition, and thereby exposes the mother to fresh dangers; and partly because the subsequent extraction must then be performed, under conditions which are much less favourable to the mother.

(3) The opening which is made by the perforator, is apt again to get blocked by the edges of the bones being pushed over one

another, or else during the progress of labour it moves away from the middle of the pelvic canal. If extraction then becomes necessary, a second opening may have to be made, as has frequently happened to myself.

(4) The extraction, when done in a proper manner, involves no risk to the parturient woman, all the less, the earlier it is performed, *i.e.* the less she has already been affected by her labour, and the less the parturient passages have been injured.

The actual extraction will be described, when we come to explain the *modus operandi*. As a last condition for operating however, I must mention that *the os must be satisfactorily dilated*. In this respect the remarks made in regard to forceps operations broadly speaking hold good. But I must draw attention to the fact that, in consequence of the head being delayed at the brim of the pelvis, the lips of the os that hang down below it, not uncommonly fail to undergo complete dilatation, since there is nothing to push them apart, and they are prevented from retracting by the impacted head. It is clear that such a condition cannot counter-indicate perforation, inasmuch as, by enabling the head to descend, we shall make it possible for the edges of the os to move out of the way. Occasionally however those edges are so rigid that they will not allow the child to pass through, without suffering injury. At such times it is not infrequently impossible to extract immediately, so that such cases form an apparent exception, although it is only apparent, to the above rule. Should the extraction be urgently indicated, the edges of the os must be incised.

§ 939. The *time for operating* may be inferred from what has been said above. As soon as it has become clear that perforation is required, the operation should be performed without delay, nor should the accoucheur allow himself to be persuaded into making farther attempts with the forceps.

The *preparations* are the same as those for a forceps operation. The complete lithotomy position is generally necessary; only where the head is below the brim, may the incomplete be sufficient. Chloroform is not absolutely essential; still it facilitates the manipulations, and above all spares the woman the dreadful and most unesthetic sensation that the fruit of her womb is being mutilated. A pail with sand or water may be placed below her bed, in order to catch the blood, brain, and pieces of bone.

The midwife can give all the assistance that is necessary: her special duty is to fix the uterus in the middle line and against the pelvis.

As regards instruments, a scissors perforator, a trephine¹, a cranioclast and a cephalothryptor should be at hand.

The operation itself consists, as already mentioned, of two acts, the perforation and evacuation of the skull, and its extraction.

a. Perforation.

§ 940. This can be performed either with *scissors*, or with the *trephine*. The *scissors*, if made according to Smellie's pattern, are dagger-shaped, when closed, and in this condition are bored into the skull. On compression of the handles, the blades separate, and thereby enlarge the wound in the bone and break its edges. Nægele's scissors (fig. 137) are one of the most



Fig. 137.—Nægele's perforator.

useful and common forms of the instrument; they are furnished with a hook which may be variously shaped, and which, when fixed, closes the instrument; by loosening the hook, the blades can be made to diverge. But Blot's perforator (fig. 138) is still



Fig. 138.—Blot's perforator.

better and more convenient. It consists of two blades, which are lance-shaped and cover one another; they are held together by a spring (*a*), and separated by pressure on the lever (*b*).

¹ I have here, and in the following sections, translated the German word *Trepan* by *trephine*, the latter term being applied in England to the more modern instrument, as for instance to the forms shown in figs. 139 and 140. (Fr.)

J. Veit (*Deutsche Zeitschrift f. praktische Medizin*, 1878, No. 27) perforates with the pointed inner arm of a cranioclast, which in this way serves at the same time as a perforator and an extractor.

The *trepine* consists of two parts, of which the internal is rod-shaped, carries the crown, and ends in a sharp-edged pyramid or in a pointed borer (centre-pin) which projects beyond that crown; the other end terminates in the worm of a screw which is worked in the female screw by a handle. The second portion is a metallic tube, which contains the rod and covers the crown, while the instrument is being applied. The best pattern is that of Leisnig, modified by Kiwisch (fig. 139)¹. I however generally



Fig. 139.—The trephine of Leisnig, as modified by Kiwisch.

use the trephine of Pajot (fig. 140), since in place of the saw it is furnished with powerful convex ground blades, which very quickly cut through both bones and soft parts, should the latter be encountered, in spite of their having been previously divided;

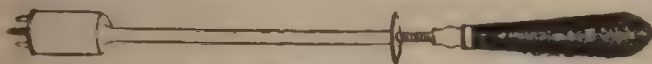


Fig. 140.—Trepine of Pajot.

and because the blades spring back into the protecting bell, until the centre-pin has taken good hold. A disadvantage of the instrument is that the blades may easily do mischief.

As a general rule the trephine should be preferred to the scissors, since it makes a large opening, with as a rule but little jagged edges², and because, where there is only slight splintering, the bone does not give way so quickly during the succeeding extraction. Moreover if the instrument happens to slip off during the operation, the mother is not so apt to be injured as she is under similar conditions, where the scissors perforator are used, in which case the uterus and vagina may be perforated³.

¹ (1) Braun has given the instrument a pelvic curve, which makes it easier to manage.

² It is rare for the trephine to cut out the bone quite cleanly; the latter almost always splinters more or less, since the instrument has to be firmly pressed against the skull.

³ This occurred once, while I was assisting at an operation in my *Clinique*.

But the trephine will only operate in the way described, where it can be applied to one of the flat bones of the skull. In all other cases, as where the operator meets with a fontanelle or a wide suture, or where he is obliged to perforate through some part of the face, the scissors are to be preferred; they should also be so, where the head is still high and very movable, since the latter can more easily be kept fixed during the short time required by a perforation with scissors, than during the longer period required in trephining.

§ 941. Before perforating the head, the operator will do well to incise the scalp, especially when the tissues are much swollen. Such an incision is not absolutely necessary, where scissors are used, but it greatly facilitates the application of the trephine, since the tissues are liable to get entangled on its cutting or even more on a sawing crown. The best instrument for the purpose is a long-handled, curved and blunt-pointed bistoury, which is passed in flat over the half or whole hand, which is lying in the vagina, and protected by the fingers which are placed against the head, and which at the same time prevent injury to the margins of the os. If the operator now applies the cutting edge to the scalp, presses with his fingers that are within the vagina, and raises the handle, the scalp will be divided down to the pericranium in a sagittal direction. The actual incision should measure 3 cm. (ca. 1 in.), but its length may afterwards be somewhat increased by the fingers, which should also detach the scalp on either side.

The practitioner, while introducing the perforator, should always protect it with his left hand, the fingers of which must be arranged around the bared portion of bone. The hand must guard the point of the instrument, *when scissors are used*, these being always introduced closed, and with the right hand. If possible, it is well to avoid perforating at a suture, since in that case the opening is more liable to be again occluded by the edges subsequently riding over one another. The blades should be held perpendicularly to the part which is to be perforated, the point of the instrument being forced through by rotatory movements. Great care must be taken that the instrument does not glance off, an accident which is best avoided by the nurse applying pressure on the head from without, and under the direction of the operator; she should keep the head fixed against

the instrument. Should the head continue very movable, the greatest care is required in applying the pressure. But with such care, it can never be necessary, it seems to me, to begin by applying the forceps, in order to fix the head and to perforate within it. This instrument hinders both hand and perforator by the room it takes up. As soon as the scissors have pierced the bone (which will immediately be felt), they must be pushed on as far as the greatest width of the blades, and the latter forced apart by compression of the handles, by which means the bone will be broken. The perforator should then be turned round its longitudinal axis, and again opened, so as to make a cruciform aperture. It is next to be pushed into the cranial cavity as far as its base, so as to break up the brain and its connections.

In order to avoid injuries, where the os is but little dilated, Horwitz ("Ueber ein Perforationsverfahren in schwierigen Fällen," *Zeitschrift f. Geburtshunde und Gynäkologie*, iv., 1879, p. 1) suggests that a Fergusson's speculum be firmly applied to the presenting part of the head, and that the perforation be performed through such speculum. This proceeding however, which Skene ("A Contribution to Obstetric Surgery," *American Journal of Obstetrics*, viii., p. 150) had previously recommended in regard to a Sims' speculum, is unnecessary, and less safe than to operate under guidance of two fingers, since the latter can perfectly well protect the edges of the os, and are much better able to prevent the head from slipping away, than is a speculum.

The *trepphine* is used in the same way as are the scissors, but the operator must be even more careful to make sure that it is applied vertically, and, whenever possible, the crown should be in all round contact with the bones of the head. If the latter is high, the instrument will often need to be pressed deeply into the perineum. As soon as the trephine is in good position, it must be fixed by the hand or fingers which are lying in the vagina, while the head is at the same time kept firmly pressed against the instrument. The operator with his right hand now rotates the crown, while keeping it firmly applied to the bone. As soon as it has penetrated the cranial cavity, which will immediately be shown by a cessation of all resistance, the instrument must be cautiously removed, carrying with it the adherent piece of bone which has been sawn out.

After perforation, the size and shape of the gap in the skull should immediately be examined. Any bits of bone, that adhere to the periosteum, may be detached by the fingers and removed, or else pressed into the cranial cavity. A metal rod should next

be passed through the opening, and the brain substance completely destroyed. The latter is then washed away with an irrigator, a measure which is mainly an æsthetic one, although it has the advantage of preventing the unpleasant occurrence of cerebral matter continuing to escape during the subsequent delivery. It is a mistake to think that the consistence of the skull is necessarily increased, if the great bulk of the brain remains inside; such would only happen, if almost the whole mass remained, and the opening again became obstructed, an occurrence which must not be allowed. When a head under these circumstances remains resistant, it will have to be perforated again, if the extraction is performed in the way which is to be immediately described¹.

b. Extraction.

§ 942. The extraction may sometimes be accomplished by *hooking the fingers into the orifice which has been made by the perforator*. But this, although a very safe proceeding, is only possible, where the pelvic contraction is inconsiderable, since otherwise the fingers could not be retained between the edges of the bone, when the latter are pressed together; they would be severely injured, whether the edges gave way or not. In other cases the movable condition of the head seems to invite the accoucheur to perform *podalic version*, and to extract by the feet. But such a course cannot be recommended, for version is by no means a simple operation in itself, while in addition the uterus is liable to be injured by edges and splinters of bone. Moreover it is sometimes much more difficult to extricate the after-coming head than was expected, and even in the condition under discussion (i.e. with movable head) it is an easier and gentler proceeding to extract the child head first.

Amongst the numerous *instruments*, which have been invented

¹ The operator must be careful to destroy the brain and especially its basal portion, for the further reason that the child might otherwise be expelled in a still breathing, or even crying, condition, as has happened on two occasions in our out-patient Maternity—a most distressing event, which may place the accoucheur in no small dilemma regarding his patient and her relatives. Sidney (*Edinburgh Medical Journal*, 1859, p. 84) indeed relates the case of a child which lived for some time after craniotomy! It is therefore a good plan to place beneath the parturient woman a pan of water, in which the fetus may be immersed, if it still gasps. This plan will at any rate prevent its emitting any sounds.

for the purpose of extraction, there are only two which are still in general use: the cephalothryptor and the cranioclast. All others are valueless in comparison with these.

In the first place I must express myself as on the whole unfavourable to any further reduction in the size of the head, by the removal of bones with so-called *craniotomy* or *bone forceps*. A broken down calvarium cannot possibly hinder delivery; and its partial or extensive removal is therefore only admissible or called for, where the bones are loose, or separated from their connections, and obstruct the way, and where there is a risk of their boring into the parturient canal, or where, on account of undue contraction, it becomes necessary directly to seize the base of the skull, and this can only be done after a removal of the vault. But even in the latter case, the cranioclast may be used, if the head has first of all been got into a suitable position.

Again, I regard the *sharp hook*, also known as the *blunt-pointed hook* (Levret, Smellie), as quite superfluous in head-first cases, and indeed actually dangerous. Its sharp curvature, the summit of which lies in the longitudinal axis of the instrument, prevents its being bored deeply and therefore firmly into the base of the skull, and yet that is a necessary condition for its successful employment, since otherwise it immediately breaks through the flat bones. The result is that it affords a bad hold, tears out, and injures the parturient canal, or else the hand of the operator; and even if the latter is sufficiently dexterous to avoid this, my large experience has shown that it is frequently necessary to apply the hook several times, and that this repeated introduction into the vulva, and the change of hands are in themselves productive of serious injury. Since therefore the hook is unnecessary, I would banish it as an instrument for extracting the fore-going head.

§ 943. The *cephalothryptor*¹ was introduced into midwifery by Baudelocque *neveu* in 1829, and, although originally a clumsy, heavy instrument, has since then been greatly modified and improved. Its general outline resembles that of the forceps, but its principle is very different. Since the cephalothryptor may be required to seize, and then to crush the fetal head while still high and often very high, it must be strongly constructed,

¹ Not cephalotrib or -tribe, as Baudelocque named his instrument. *τριβω* means "I rub or stroke"; "I crush" is *θρύπτω*.

and be much longer than the forceps. Moreover its blades must be unfenestrated¹ and in extensive contact at their points (2.5—3 cm. = ca. 1 in.), so as to grip the head firmly. They must also have a slight cephalic curve (not more than 5.5 cm. = ca. 2 in.), and a good pelvic curve so as to be able to seize a high-lying head fully and at its middle, while still above the anterior pelvic wall². Lastly, the handles which in other respects resemble those of forceps, must have a compression apparatus, which is easy to manage and yet holds firmly. All these requirements are satisfied by Busch's instrument, which measures 51 cm. (20 in.), has a cephalic curve of 3.5 (ca. 1.5 in.), and a pelvic curve of 10 cm. (ca. 4 in.). The compression is effected in the original instrument by a screw, but this can be replaced by the more convenient compression apparatus provided on Braun's cranioclast (fig. 141).

Cephalothrypsy consists of three acts: *the application of the instrument, the crushing of the head, and the extraction of the same.* Excerebration is assumed to have already taken place; for without it the necessary crushing and reduction of the head are impossible. The cephalothryptor must be applied according to the same rules as are the forceps, but care should be taken to see that the blades lie as much as possible against the middle of the head, and that they grip the latter in its whole extent; this is the safest way of preventing the instrument from slipping. It is often a good plan from the first to apply the blades somewhat obliquely in relation to the pelvis, since they will then tend to produce compression in the sagittal diameter of the pelvis, while under other conditions the head would be elongated in that direction. As soon as the blades are united, the head is crushed. This however must be done slowly, carefully, and at intervals, and every now and then the operator should examine the effect produced. He will thus be able to prevent the escape of the head from the blades, and ensure that the latter lie in the same position after compression as they did before it. Splinters of bone too will only form slowly, will remain beneath the scalp, or at any rate not pierce it suddenly; they will moreover be

¹ Fenestrated blades would allow the passage of splinters of bone and consequent injury to the maternal parts.

² Instruments without, or with only a slight, pelvic curve, such as have in recent years been recommended (Kidd; Kutenkampff, *Berliner Klin. Wochenschrift*, No. 51, 1872), are only suited for cases where the head lies low.

discovered in time, and removed before any damage has been done.

The extraction, which is the main point, can only be effected easily and smoothly, when the head is already fairly low, and when it has, so to speak, overcome the obstruction of the pelvic brim. When, on the other hand, the head lies high, the sagittal elongation, which results from its being compressed transversely, gives rise to great difficulty, since the pelvic contraction is usually confined, or mainly so, to the sagittal diameter. It is this condition, which is the principal cause of the severe contusion of the maternal soft parts and of the partial, or complete, slipping of the instrument. The only way of avoiding the difficulty would be so to rotate the head with the instrument that the diameter, which is being compressed, might come to lie as much as possible in the shortened pelvic diameter, a proceeding



Fig. 141.—Busch's cephalothryptor (with the compression apparatus of Braun's cranioclast).

which is hindered by the marked pelvic curve of the cephalothryptor. And even if this manœuvre is not absolutely prevented, it is indirectly so by the liability of the parturient canal to be severely bruised and wounded during these rotations¹, owing to the great sweep which the point of the curved instrument must make, especially as in most cases such rotations need to be repeated more than once. Indeed not uncommonly when the head has been rotated, it becomes necessary to open or take off the instrument, so as to re-apply it in a diameter which has so far not been compressed, and thus completely to crush the heads (*céphalothrypsie répétée*, Pajot). Not only however do these repeated operations cause damage, but the non-resisting head

¹ It is on account of these rotations that *straight* cephalothryptors have been recommended. But where such rotations are necessary, the instrument usually fails to take a good grip, so that straight instruments are superfluous.

will under such circumstances offer no hold, when pulled on by the instrument, so that the latter easily slips off.

§ 944. The *cranioclast* (fig. 142) is a powerful bone forceps, consisting of two arms, that can be united like those of the forceps. The two blades are gently curved on their broad aspect. The one which is destined for the cranial cavity, is massive, and grooved or somewhat spinous on the side which will be directed towards the bone or the other blade, so as to give it a firmer bite. The second blade, which is destined to lie on the outer side of the head, is fenestrated, so as to admit the parts that have been seized. Braun has provided the lower ends of the handle with a compression apparatus (*c*), which connects the arms, and fixes the instrument into the tissues that have been seized, so that simple traction is all that is required.

Simpson believed that the base of the skull could be broken



Fig. 142.—Cranioclast, according to Braun's pattern.

by means of the cranioclast, and considered such fracturing to be its main object; hence the name of the instrument. Later obstetricians regarded the instrument merely as a bone forceps, the object of which was to break the bone that it had seized, to remove it and thus to disintegrate the calvarium. Both views however are erroneous. *The cranioclast is simply a traction instrument*, and would therefore be more appropriately called *craniotractor*, as Munde (*l. c.*) has rightly remarked. This indeed is the view which Winckel (*l. c.*) formerly wished taken of the old bone forceps of Mesnard, and what he for instance then pointedly observed in regard to extraction with that instrument, holds good nowadays for the cranioclast. The great advantage, which this instrument possesses as a tractor, is that it pulls on the tough, firm scalp, and thus acts directly on the face and neck, so that the traction is not merely exerted on the thin, loosely connected bones. Nor can the instrument itself, of which only one arm lies between the parturient passages and

the head (into whose coverings it is deeply pressed), injure those passages, since it takes up no room, while on the other hand the head from which the brain has been removed, becomes moulded during the traction, and, by a shifting, flattening and bending of its bones, adapted to even considerable pelvic contraction. Further, it is scarcely possible for the splinters to do damage, since the bones usually break inwards, and the scalp covers the edges and splinters, while there is always sufficient room for the hand of the operator to supervise the part that has been seized. The cranioclast is easy to apply, whatever the presentation or position of the head, whether this is low or high, or extra-median and movable; also with the most abnormal attitudes. Moreover, what is of special value, traction may be made in any direction or curve that is desired, just as the situation of the greatest resistance or the attitude and the position of the head happen to require. Nor will there be any risk of injuring the genital canal by manipulating the instrument. The external blade is entirely protected, by the coverings of the skull projecting beyond it.

The application of the instrument is easy. The intra-cranial blade, guarded by the hand, is passed into the opening made by the perforator, and pushed on as far as the base of the skull. The other blade, under guidance of the same fingers, is now applied to the outer surface of the head, and indeed to the spot which is most accessible, and upon which it seems easiest to apply the strongest and (as regards direction) the most favourable pull. If the outer blade has been correctly applied, the inner one can easily be adjusted, since no harm can be done, while it is inside the skull, however much it is twisted and moved about. The locking is sometimes rendered somewhat troublesome by the fact that, owing to the shortness of the blades, the lock lies in the vulva or even in the vagina; but this can scarcely be avoided, since if the lock were placed nearer the handle, the approximation of the blades would be less certain. During traction, both the instrument and the tissues it has seized, must be watched with the intra-vaginal hand, so that any slipping may immediately be noticed. Should such slipping occur, the instrument must be opened, and the outer blade applied at some other spot; but the inner one may remain *in situ*, since, as already stated, it can be turned and made to follow

the former in any direction. If the principal mass of the head, *i.e.* the basal portion, refuses to descend, when pulled on, it is a good plan to apply the cranioclast to the face, and to pull down the chin first (one branch being passed into the mouth, the other over the chin and the anterior cervical surface, or else one into the cranial cavity, the other along the forehead and face). In this way the mento-occipital diameter is brought into the parturient axis, and the suboccipito-parietal or the cervico-parietal into the sagittal diameters, in which it is compressed by the pressure, and by which the head receives the favourable cylindrical shape. If there is a very considerable want of room, the calvarium may be removed with the cranioclast, and the base of the skull seized and extracted edgewise, *i.e.* vertically to the plane of the brim. If however the lower limit, in which perforation is admissible, *i.e.* the limit which was given above, is adhered to, it will scarcely ever be necessary to adopt such a course.

§ 945. I may recapitulate what has been said in regard to cephalothrypsy and extraction with the cranioclast, in the following way :

The cephalothryptor is a troublesome instrument to use, and is difficult to apply in such a way as to take a good hold of the head, especially when the latter is high, and neither square nor median as regards the brim ; the instrument too under such circumstances is apt to slip off. Moreover it renders extraction difficult, by elongating the head in a direction at right angles to that compressed. In order to counter-act this, the head has to be repeatedly rotated, and the instrument has usually to be repeatedly opened and re-applied. These various manipulations and conditions are apt to injure the parturient passages, while in addition damage is liable to be produced by the size and edges of the instrument, even more readily than in forceps extractions. Indeed it is quite impossible to extract the head through the pelvis, and to make free use of the regions of least resistance, without a great risk of such injury.

The cranioclast is easy to apply, holds firmly, and rarely slips off. Moreover owing to its small bulk, and to the fact that it does not in any way encroach on the space that is available for the head, it can be used where there is much less pelvic space than can the cephalothryptor. Again, it can be applied in any

diameter of the pelvis, and does not cause compression of the head more in one diameter than in another; it merely leads to the diminution of the various cranial diameters by pulling out the skull in the form of a cone with one end foremost, and thus reducing the circumference *in toto*. Lastly, it allows the head to be drawn to any point, where there is most room, which can thus be safely utilised. For all these reasons extraction with the cranioclast will be found comparatively easy, even under the most adverse circumstances. On the other hand it is scarcely possible for the instrument itself to injure the parturient passages; indeed even the rare indirect injuries that are produced by the head, are scarcely ever important, in consequence of its yielding and plastic condition. In a word, by the introduction of the cranioclast or bone forceps as simple extractors, perforation has become converted into a comparatively easy, simple and safe operation¹.

§ 946. When the head has been extracted, it is generally a good plan not to draw out the trunk immediately, but to express it. If however extraction appears necessary, this may be effected by acting on the neck or the axilla, a blunt hook being passed into the latter in case of difficulty. If even this plan fails, resort must be had to the introduction of a sharp hook into the trunk, or to crushing of the thorax (*embryothlasia*).

The condition of the mother usually requires close attention. The vagina and, when necessary, the uterus too must be thoroughly irrigated with disinfectants; it is also very important to promote a good retraction of the uterus.

If the relatives are anxious to see or to bury the child, the opening in the scalp must be sewn up. It may sometimes be desirable to stuff the latter, after removing any bits of broken down bone.

A great number of (in some cases) very ingenious instruments have been invented, either with a view of completely reducing and crushing the head and especially the base of the skull, or of overcoming great pelvic contraction by a piece-meal extraction of the head, or of giving the operation a more

¹ Since 1872—'73, 47 women in my *Clinique* have been delivered by the cranioclast. Death occurred in 7 of these cases, three of which were brought to us in a state of serious illness (infected), after having been in labour for a long time (*cf.* § 937). One other clearly contracted puerperal septic infection, while under my care: a further one had possibly also been infected, when brought in from the out-patient Maternity; and in 2 cases attempts had been made to deliver with the forceps.

elegant aspect. But these instruments have not come into general use, and will never do so, owing to the difficulty of using them, and to the absence of any advantage over the methods that have been described above.

Amongst the number we may mention Van Huerel's forceps-saw, *forceps-erie* (*Mémoire*, Brussels, 1842; cf. also Scanzoni's *Beiträgen*, i., p. 71), a forceps between whose blades a chain saw works on the head, and splits it into two halves. Robert Barnes has mentioned a similar method (cf. *Lectures on Obstetrical Operations*, p. 306), in which the vault of the skull is removed with the craniotomy forceps; the remainder is then fixed by a hook, and divided into two by the chain of an *déscieur*. I imagine that if all this can be done, the measures recommended above will do the work more quickly and simply. The same remarks apply to the *diantryptor* of Didot (*Prusse Médicale*, 1854), the *cutting forceps* (*Lahitem*) of Ritgen (*Monatsschrift f. Geburtskunde*, vi., 1855), the *perforator cephalotribe* of Cohen (*ibidem*, x., 1857), the *déscieur céphalique* of Joulin (*Gazette des Hôpitaux*, 1862), the *xycephalotome* of Fenizio (*Zeitschrift der Aerzte zu Wien*, xii., Feb. 1856).

The following instruments and methods have been introduced for perforating the base of the skull, and then extracting, as may be necessary: the *forceps perforatore* of Lollini (*Monatsschrift f. Geburtskunde*, xxxii.), the *intra-cranial cephalothrypsy* of Guyon and Wasseige (*Gazette des Hôpitaux*, 1867, No. 145, and *Centralblatt für Gynäkologie*, 1877, p. 153); the repeated *sphenotress* or *transforation* according to Hubert (*Archiv f. Gynäkologie*, i., p. 179); Simpson's *basalgut* (*Contributions to Obstetrics and Gynaecology*, Edinburgh, 1880, p. 337).

§ 947. *The reduction in size and the removal of an after-coming head* is an extremely difficult operation, where necessary; where easy, it is almost always unnecessary. In other words, the head will only be easy to perforate, where it is very accessible, i.e. where it has already descended to a certain distance into, and through, the brim, and if so, the accoucheur will almost always be able to extract it with his hand, without resorting to perforation. Perforation is difficult, when the head is still high above the pelvis, for the reason that it can then only be reached with the finger, certainly not with the hand and instrument to a sufficient extent for these to be able to act effectually. And even if the accoucheur succeeds in opening the cranial cavity, the opening will lie at the articulation of the head with the neck or else at some point in the vertebral column, and this, by diminishing the strength of the vertebral column, forbids any violent traction being made on it; so that here also he will be compelled eventually to get a direct hold of the head. Such hold however can only be satisfactory and secure, if obtained by means of the cephalothryptor. Now if this instrument has after all to be used, the previous perforation will have been superfluous, since the

after-coming head can only elongate, without meeting with resistance, towards the free uterine cavity; the base too is directly and completely crushed to start with. For these reasons I myself have never been obliged to perforate the after-coming head. Whenever I have failed to extract the latter with my hand, it has also always been so high that I have found it either impossible, or extremely difficult, to open; and under such circumstances the cephalothryptor has always completed the extraction satisfactorily. While therefore I cannot recommend this instrument for head-first cases, I regard it as most appropriate for head-last¹.

The perforation cannot be done with the trephine; for the operator would, as Kihau advises, have to bore through the base of the skull between the chin and the vertebral column, after previous division of the soft parts; where there is sufficient room for this, perforation could hardly be necessary. The perforation, if undertaken at all, is best done by pushing scissors through a posterior lateral fontanelle, or if this cannot be reached, through the foramen magnum, between the atlas and occiput (Michaelis). The extraction can then be accomplished, by passing a sharp hook through the opening, and fixing it against the base of the skull. Birnbaum (*Berliner klin. Wochenschrift*, 1878, p. 84) recommends the use of the hook, mainly in order to tilt the base of the skull obliquely in reference to the brim of the pelvis, by drawing down one side. Coburnstein (*Archiv f. Gynaekologie*, vi., 1874, p. 503) suggests that the spinal canal be opened in the region between the cervical and thoracic vertebrae, by removing 4-6 vertebral arches, and that the brain from there be destroyed and evacuated with a catheter or a lithotomy sound. Halberstma (*Tijdsch. v. Geneesk.*, 1872) prefers passing a guarded hook into the orbits, and from there pushing it into the cranial cavity, so as to allow the brain to escape.

¹ In view of what has been said in §§ 534 and 535, I have been obliged to allow the above statement to stand. But in my experience it is certainly not more difficult, indeed it is easier, to perforate the after-coming head, even when still above the brim, than it is to apply the cephalothryptor. I have always succeeded, by using scissors which were curved on their broad surface, in boring them in in front just behind the symphysis, between the atlas and the foramen magnum. It will usually be impossible to get at a posterior lateral fontanelle. During perforation the head should be well fixed from without, or else, as Fritsch suggests (*l. c.*, p. 282), the child may be pulled downwards and backwards by its legs, in order to make room in front, and to force the head firmly against the brim. Further, it is well to see that the brain flows out freely, and to try to draw the head down by pulling at the lower jaw and the shoulders, assisted by firm external expression, which here is of special importance. If the brim of the pelvis obstructs the base of the skull, the head may be turned round its longitudinal axis by means of the lower jaw, in order to render that base oblique. If however manual traction does not succeed, the extraction should be effected with the cephalothryptor, care being taken that the skull, especially its base, is thoroughly broken up. It is not a good plan to draw down the unperforated head with the cephalothryptor, owing to the risk of severe contusions; with skilled management the instrument has a sufficient hold, even where the head is perforated. (W.)

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6. Embryotomy.

§ 948. By this term is meant the mutilation of the body of the fetus. This operation is in some cases connected with perforation, either as a sequel to the latter, or else, where the pelvic extremity presents primarily or has been brought down, as a preliminary measure. It will however only rarely be called for, if the accoucheur makes it a rule not to attempt to deliver *per vias naturales*, where the degree of pelvic contraction is such as has been stated to be an absolute barrier to delivery.

Embryotomy will be most often required, where the child's trunk is absolutely or relatively too bulky, and in regard to these cases I must refer to what has been said in the chapter on "Difficult Labour." It may then be sufficient to seize, crush and extract the trunk with the cephalothryptor; or else one or other of the cavities of the trunk (whichever is most accessible) may have to be opened with the scissors perforator or a similar instrument. From there the operator may penetrate into the other cavity, and in this way and by the removal of the contents, or of large portions of viscera, so reduce the size of the body that it can be extracted (*exenteration, erisceration*).

A similar operation may sometimes be required in the case of double monstrosities. The exact conditions have already been described (*cf.* § 628). No general rules can be laid down as to the *modus operandi*, since the operation will vary with the existing circumstances.

It is well however to make a rule of adopting the simplest method, and not to complicate the operation by removing parts that cause but little obstruction, and to avoid cutting up the child, or removing entire limbs. On the other hand, this rule must not prejudice the operator in cases where extensive mutila-

tion will serve to facilitate and accelerate this most disagreeable operation.

Embryotomy is most often called for in cases of so-called *neglected transverse presentations*; the exact conditions have been explained in § 646. The head may then be severed from the trunk, with a view of each part being afterwards extracted independently (*decapitation*); or the size of the trunk may be reduced, so as to allow the operator to reach the pelvic extremity, and to extract the child by means of the latter after the manner

of spontaneous evolution, or also to extract it *corpore conduplicato*. Decapitation is always the simpler, milder and more speedy method, and should therefore be selected, where the neck is easy of access. In other cases we are restricted to exenteration.

§ 949. There are several ways of performing *decapitation*.

(a) If an arm is prolapsed, it may be forcibly pulled at, in order to cause the neck to descend. The operator now carries his index finger, or it and the middle finger of the hand, round the neck, so as to hold the latter firmly downwards. His other hand then applies to the neck long, powerful scissors, somewhat curved on their broad surface, and cuts through the soft parts and the vertebral column with short snips, under guard of the finger. If his fingers are unable to pull down and

fix the neck, they may be replaced by a blunt hook, whose handle must be drawn down by the assistant, while the cutting is done.

(b) The operation can frequently and very conveniently be performed with Braun's *blunt hook*. This is a powerful hook, which is provided with a transverse handle, and flattened at its hooked extremity, and which terminates in a knob with a sharp curve (fig. 143). The neck of the child is first surrounded with several fingers, and the hook then passed up along the anterior pelvic wall, applied to the neck, and firmly pressed upon the

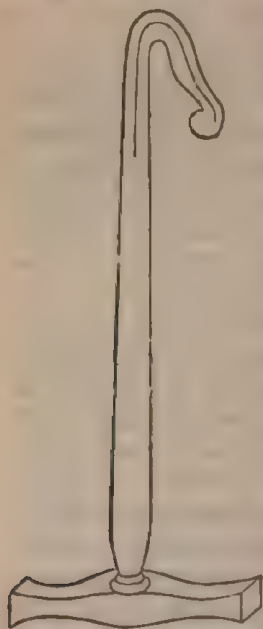


Fig. 143.—Braun's decapitating hook.

latter by a vigorous pull downwards. The instrument is now steadily pulled, under guard of the intra-vaginal fingers, and rotated several times in the same direction, until it fractures the vertebral column. If the soft parts still hold together, they may be drawn down and torn through with the hook, or else cut through with scissors.

The blunt hook however does not always accomplish its purpose, especially when the neck is thick, and cannot be got sufficiently far within the curve of the hook. It must also be borne in mind that during the torsion the walls of the lower segment of the uterus are exposed to a by no means slight pressure, since that segment is firmly applied to the head, and receives the whole of the force expended. Although therefore the hook is usually very useful, great care is necessary in applying it.

According to Pawlick (*l. c.*), 69 out of 87 women in whom decapitation was carried out with Braun's hook, recovered. = 79 p. c. He considers that the hook can be used, even where the neck is thick, since it need not embrace the latter completely, but only encircle so much of the vertebral column as will give a firm hold. As soon as traction is made downwards, the button passes through the soft parts on the anterior aspect of the column, the latter being dislocated with the first axial rotation.

Levet's hook, which is provided with a sharp edge along its curve, with a view of cutting through the neck, is dangerous to the soft parts of the mother, and, since it is unnecessary, should be rejected. The same objection applies to all the other forms of decapitation knives, which are provided with a sharp edge. And although the most recently invented of these instruments, viz. the sickle knife of Schultze (*Küstner, l. c.*), has some advantages over the older forms (it not merely allows a pull downwards, but also extensive sawing movements, which divide the fetal parts more rapidly and easily), still even its use is only free from danger in the hands of very skilful operators. A less experienced practitioner runs a risk of injuring himself and his patient.

For the sake of completeness, I may also mention Concato's *decapitator*, Scanzoni's *anckenlater*, and the numerous proposals for dividing the neck with ligatures, which now and again may be found serviceable. For instance there is the *constricting apparatus* of Heyerdal and Keirulf, which acts like other constrictors and serre-noeuds, the method of *sawing* and *fiddling* (as Hohl called it) *through* the neck with an hempen cord (Kidd, Pajot), or with wire (Wright); the cutting through with the *ecraseur* (Stiebel) or *chain-saw* (Faye, von Becken, Tarnier), or with the *ligature saw*, which consists of a cord surrounded by iron wire (Thomas), and so forth. These various appliances are passed round the neck with hooks, sounds or tubes like that of Belloe.

§ 950. When the neck has been divided, the trunk can easily be drawn out by the prolapsed arm. A sharp hook, passed into the thorax, is sometimes of assistance.

The detached head must soon be extracted, since otherwise the internal os may contract below it, and thus render it less accessible. Its removal is easy, where the space relations are normal. Indeed expression alone often suffices to press the head down to the floor of the pelvis, from which it can be removed either with fingers, forceps or hook. But the best plan is, before pressing down the head, to get access to the mouth, and then to pass one or two fingers into it, and to extract the head by the jaw with the assistance of expression. The mento-occipital diameter will then correspond to the pelvic axis. If the fingers get exhausted, they may be replaced by the hook or forceps.

There will be more difficulty, when the head is prevented from entering the pelvis, owing to contraction of the latter. The head must then be fixed against the brim by means of external pressure, and seized with the cranioclast, one blade of which lies within the mouth. If the latter cannot be reached, the cephalothryptor sometimes acts admirably. In other cases the cranial cavity must be again perforated, and then the help of the cranioclast called in. It is a mistake to suppose that, when the head is pulled, the brain will always flow out through the foramen magnum; the latter is usually not even open, either when the head has been cut or torn off, while if the vertebral column has been divided further down, the brain is often so loth to pass out, that perforation may be required. The only difficulty arises from the mobility of the head, and this must be corrected by external pressure. If the practitioner knows what manipulations are at his disposal, he will be able to modify his procedure in any particular case, according to the existing conditions.

§ 951. Where a transversely placed fetus cannot be decapitated, *evisceration* must be resorted to. But even in the opposite condition, *evisceration* is advisable, if the pelvis happens to be contracted, for the reason that a detached head may under such circumstances be difficult to seize, while on the other hand it is much more easy to extract, where head and trunk are continuous. Of course where the head has remained high, it will generally be possible to avoid mutilating the child, by turning it.

While the cavity of the trunk is being opened, every possible care must be taken to avoid injuring the mother. On no account is the child to be pushed forcibly upwards, since its body is

partly expelled into the cervix and vaginal fornix, and a rupture of the uterus might result. It is better to have the uterus well pressed downwards, and then to pass a perforator or similar form of scissors between the ribs, enlarging the opening by a cruciform incision and by the fingers, and breaking the bones that have been acted upon (any spicules of bone being removed to prevent their injuring the operating hand), until half the hand can be easily passed into the cavity of the thorax. As many of the viscera, as is necessary, may now be removed, and the abdominal cavity reached, if it is desirable, through the diaphragm, the external wound being enlarged, as required. The arm should, as far as possible, be left untouched, since it may afterwards be very useful in assisting the extraction.

As soon as sufficient room has been gained, extraction may be undertaken, *after the manner either of spontaneous evolution or of delivery conduplicato corpore* (cf. § 641). Some operators force a way to the feet, and then turn and extract by their means. But this is a most troublesome and (bearing in mind the existing expansion of the cervix and vaginal fundus) dangerous proceeding. It is better, in imitation of spontaneous evolution, to draw the breech down and past the shoulder, the latter being forcibly pushed towards the other side (cf. § 892). The accoucheur will then find it comparatively easy to reach the breech, and to get a *point d'appui* at the lower end of the vertebral column, at the hips or even at the anus; but a hook may occasionally be used with advantage. Sometimes too the pelvic extremity will be reached more easily, if the vertebral column is flexed, either with the finger or by passing a hook round it, through the opening that has been made in the trunk.

The extraction *corpore conduplicato* (Douglas, Michaelis, Veit *l. c.*) presupposes that the vertebral column has been broken with the hook, or cut through with a powerful pair of scissors, unless indeed the fetus is very small and yielding. This method will only succeed, where the shoulder has already been pushed far down, and where there is plenty of room; for with it, as will be remembered, the head passes through the pelvis at the same time as the trunk. The actual extraction will be effected by pulling at an arm.

Simpson's suggestion ("Works," i., 1871, p. 502) that the fetus be entirely cut through (*spondylotomy*) at its most curved,

i.e. deepest, part, and then extracted in two pieces, can only be carried out, where the conditions are very favourable. Sometimes again the trunk may be pulled out with the cephalothryptor; indeed this instrument may be a great assistance in cases of difficulty.

§ 952. In the last place I must mention that the requirements and preparations for embryotomy are exactly the same as those mentioned under "Perforation." The question whether it is lawful to cut up a living foetus, is quite an idle one, since this operation, which is most repugnant to every accoucheur, is solely undertaken in the interest of the mother, and only when that interest absolutely and urgently requires it. Chloroform is required for the same reasons as with perforation. The prognosis however is not so good as with the latter, partly because embryotomy is as a rule performed under much less favourable conditions of labour, and partly because the necessary manipulations on an average cause more injury to the parturient passages.

It will be obvious that, where the mutilated foetus cannot be at once disposed of, any injuries that have been caused, should, as far as can hurriedly be done, be covered and sewn up. We need not expose the darkest side of our art to the unprofessional eye.

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7. *Cæsarian Section.*

§ 953. *Cæsarian section*, also called *gastro-hysterotomy*, has for its object the extraction of the fœtus through an incision made into the abdomen and uterus of the mother.

The history of this operation reaches far back into mythical times. Demi-gods and heroes, Dionysius, Æsculapius, Lichas (Virgil's *Æneid*, Book x.) are said to have been excised from their mother in this way. The *lex regia*, which is attributed to Numa Pompilius, directed that no woman, who was advanced in pregnancy or who died during labour, was to be buried, until the fœtus had been removed by Cæsarian section; and it is said that some distinguished men owe their life to this injunction, *e.g.* Scipio Africanus (*prior natus*), Manilius, Andrea Doria. Shakespeare shows that Cæsarian section was occasionally performed on the corpse in his day, for in "*Macbeth*", the hero, who could not be slain by man or woman born, nevertheless falls, since

"Macduff was from his mother's womb
Untimely ripped."

The Roman law referred to above, was transferred into almost all subsequent legal codes; and the Church especially, which regarded the fœtus as possessing a soul, directed that, for the sake of baptism, if for no other reason, the injunction should be strictly adhered to; indeed as late as the middle of the last century the King of Sicily condemned to death a medical man who had neglected to carry it out. Plinius correctly derives the term "*Cæsar*", which is given to the fœtus preserved in this way, from "*a cæso matris utero*", from which the designation "*sectio Cæsarea*" is derived.

There can be no doubt that the first time that Cæsarian section was performed on a living woman was in a case of hernia of

pregnant uterus, Jeremias Trautmann of Wittenberg being the operator (1610). This statement remains true, in spite of certain supposed references in the Talmud, and of Mauriceau's view that Edward VI. was born of Jane Seymour through Cæsarian section, the latter dying twelve days later [Churchill has shown that the operation was not a Cæsarian section]; in spite of Roussel's book on the subject, and of Nufer's famous operation which is alleged to have been the first; and in spite of the stories of Bauhin *inter alios*. But the operation only assumed its proper place during the last century, at the time when the whole art of Midwifery made a fresh and rapid start. I have no room here for further historical details, since the object of this book is merely to describe how the matter stands to-day.

§ 954. Cæsarian section is one of the most hazardous operations, as far as the *mother* is concerned. The reasons are obvious. The danger arises 1. from the great disturbance (*i.e.* the so-called shock), which necessarily accompanies injury to an organ, which is functionally so active and rich in nerves, as is the uterus during parturition; 2. from the risk of secondary uterine hæmorrhage, a risk which cannot be avoided by ligature; and 3. from subsequent peritonitis. The progress which intra-abdominal surgery has made during the last 20 years, more particularly in relation to ovariectomy, may well make us hope for a diminution in the mortality after Cæsarian section. We are better able now to prevent secondary hæmorrhage by means of uterine sutures than we previously could, while we may also reasonably look for the prevention of peritonitis in the future, since we now know that it is merely a result of septic infection. But even if this expectation is fulfilled in a high degree (too few operations have as yet been performed with all the modern improvements to settle the question), still the mortality will always remain high, in comparison to other similar operations; partly, because it must sometimes be performed under circumstances which gravely compromise and interfere with success, as far as the latter is dependent upon the general condition, and because we cannot choose our cases, as we can with the operations that are compared to it; partly again, because the genital tract may have been infected before the operation, even when during the latter the most minute antiseptic measures are taken, and because the abdominal cavity may at a still later period be infected by means

of the uterine cavity; and, lastly, because the liability to absorb septic matters, to retain and transport them by the blood and lymph channels is at no time so great as during, and soon after, labour. Moreover the fact that the uterus is already from the beginning of labour undergoing retrograde processes, is doubtless not without influence on the progress of the wound (*cf.* West, *Medico-Chirurgical Transactions*, vol. 34, 1851). These facts explain why no intra-abdominal operation is so frequently followed by peritonitis as is Cæsarian section.

An attempt has been made to estimate the danger which the mother runs by submitting to the operation, by collecting the results of a large number of cases. The most recent collection of the kind is that made by Harris (*American Journal of Obstetrics*, April, 1881), and gives a mortality of 58 p. c. on 120 Cæsarian sections; Mayer (*Sulle Gastroterotomia*, reviewed in *Wiener Medic. Wochenschrift*, No. 67, 1868) found a mortality of 54 p. c. out of 1,605 operations, a figure at which Michaelis also arrived, while Kayser placed his at 62 p. c. But all these statistics only show the great risk of the operation, and that risk we already knew on *a priori* grounds. They do not furnish the actual mortality, since they extend over too great a period of time, and embrace cases which have been treated according to the most various principles and under the most various circumstances, and in which, in a word, there was no resemblance except that they were Cæsarian sections. A conclusion as regards the mortality of the operation, could only be based on such a calculation, if all the operations that have been performed, could be brought together, and this can never be, since the majority of unsuccessful cases are, for obvious reasons, never published¹. We shall however not go far wrong in assuming that hitherto a full $\frac{2}{3}$ of the whole number have terminated fatally².

¹ Hitherto I have operated 5 times: twice on account of pelvic contraction, once on account of cancer of the uterus, twice on account of retro-cervical, subserous myomata—all 5 times unsuccessfully.

² Cæsarean section, repeated on the same person, seems to be more successful; Kayser puts his mortality at 29 p. c. In by no means a few cases has it been performed twice with success (*cf.* Stoltz, *Monatsschrift f. Geburtshunde*, vi., p. 102; more recently Schlemmer, *Centralblatt f. Gynäkologie*, 1881, No. 6; Lungeen, *American Journal of Obstetrics*, Jan., 1881; Litzmann, in the last case Cæsarian section was successfully performed for the 3rd time according to Porro's method by Werth [*Arch. f. Gynäkologie*, vol. 18, p. 228]). Winkel senior records a case of 3 successful operations. Merz also of "a on the same woman, although the third was

As regards the *child*, the danger is practically nil, if only those cases are considered in which, as is only fair, the children are in good condition at the beginning of the operation. It is true that the incision into the placenta, or difficulties in the extraction might lead to a certain amount of asphyxia; but the latter is easily and promptly remedied, if assistance is at hand, as it ought to be. Although then we find the mortality of the *fœtuses* after the operation set at almost $\frac{1}{3}$ = 30 p. c., this result is of no value, since the death of these children has frequently occurred previous to, or was imminent at the time of, the operation.

§ 955. The preceding statement of the risk that accompanies Cæsarian section, makes it easy to settle the indications for operating on a living woman. These are only sufficient, where delivery *per vias naturales* is absolutely impossible, the limit for which was stated to begin at 54 mm. (ca. 2 $\frac{1}{4}$ in.). Under such circumstances perforation and extraction of the broken up head and trunk of the child usually involve so much danger for the mother that Cæsarian section is quite as safe a proceeding, and in not a few cases is the safest of all. The operation must therefore be done, whether the child is alive or dead. I admit of course that the above limit does not rigidly define the point at which delivery becomes absolutely impossible. There are some pelves, in which the shortest diameter is less than 54 mm., and which still allow perforation (sc. *embryotomy*), without serious injury to the mother. Especially is this true of pelves, which are mainly contracted sagittally, and in which abundance of room remains in a transverse direction; in such the limit, as stated above, may be too high, and not begin till 40 mm. (1.5 in.). The higher margin must therefore only be regarded as a general average, the question in any individual case being open to modification, where the experience and judgment of the accoucheur permits him to deviate from the rule, and to perforate with a conjugate of less than 54 mm. (2 $\frac{1}{4}$ in.). There are plenty of cases in which this has been done with success.

Lastly, I need scarcely add that it is not pelvic contraction alone, which makes delivery absolutely impossible. I have already,

unsuccessful (*ibid.*, x., 379]. Michaelis [*Neue Zeitschrift f. Geb.*, vol. v.] and Ottler in Greiz [*Monatsschrift f. Geb.*, xxiv., p. 441] each record a case of 4 successful operations.

under the proper headings (*cf.* §§ 586, 595—596, 599—601, 603), shown to what a great extent cancer of the parturient passages, tumours of the most different kinds, atresia and adhesions in the parturient canal may do so, and how fully justified Cæsarian section may be under such conditions.

Apart from this absolute indication, books on Midwifery mention, and there appears to be almost universally adopted, a *conditional* indication, which exists in the third degree of disproportion (*cf.* Vol. II., p. 62), when the child is alive and vigorous, and when the mother gives her free consent to the operation. In such cases Cæsarian section is recommended in order to save the child and possibly the mother also. But in view of the uncertainty with which the recovery of the latter can be anticipated, and the improbability of such an issue, the question in actual practice amounts to this: are we to sacrifice the mother for the sake of the child? No one can advise her to submit to the operation under such circumstances. In the little text book (*Lehrbuch*), which I wrote 20 years ago, I expressed my views as to the lameness of the arguments in favour of this "conditional" indication, and I do not hesitate now entirely to reject it; Löwenhardt (*Aphorismen*, p. 86) and especially Hugenberger (*l. c.*) have also lately expressed themselves strongly in the same direction. Indeed, it is incomprehensible how a medical man can dream of asking a parturient woman or her friends such a question as: shall I perform Cæsarian section or perforation? The woman is utterly incompetent to give an unbiassed judgment, nor indeed can she clearly grasp the true condition. This may, of course, be explained to her, but everything depends on how it is done; and even if the *pros* and *cons* are impartially stated, yet her consent may be the reverse of free. To rely on her reply at such a time is to show a lamentable ignorance of what humanity is! Credé has truly said that the majority of parturient women are utterly incapable of deciding, and grow more so, the further their labour has advanced; and the honest admission of this teacher, on being asked by the husband of the parturient woman, after he had explained the hopeful aspect of Cæsarian section, whether he would under similar circumstances allow the operation to be performed on his own wife, "as a medical man I would consent, but as a husband I would unhesitatingly refuse" (*Neue Zeitschrift f. Geb.*, xxx., 1851, p. 346) is

a stronger condemnation than any words of mine could be, of this "conditional" indication.

But although such conditional indication must be rejected, it may now and then happen that, after the accoucheur has faithfully explained the state of things, the entirely free mother will request him to perform Cæsarian section, as the most likely means of saving her child. If he feels convinced that the mother is willing to risk her life, then on the other hand he has no longer the right, as a faithful counsellor, to destroy the child for the mother's sake. Under these circumstances alone can the "conditional" indication be legitimate, and rarely will this happen.

Cæsarian section must be performed on the *dead* or even *moribund*, pregnant or parturient woman, when there is a prospect of saving the child, and when, as is almost always the case, it is the gentlest proceeding for the purpose. I have already said enough as regards this indication in §§ 269 and 270, and need not repeat. The most recent investigations of Runge (*Archiv f. Gynäkologie*, xii., p. 16) and Zuntz (*Pflüger's Archiv*, xiv., 1877, p. 605) have afforded additional confirmation of the justifiability of the operation on a woman *in articulo mortis*.

Quite lately Sommerbrodt (*Berliner klin. Wochenschrift*, 1880, No. 8) has published a case of Cæsarian section performed on a woman *in articulo mortis* in which the child was saved; so also has Frank (*Centralblatt f. Gyn.*, 1881, No. 25). For further instances of Cæsarian section performed after death in which the child was saved, *vide* Vol. i., p. 368. To these must be added the cases recorded by Maigrier (*Progrès Médical*, 1879, No. 3), and Storch (*Centralblatt f. Gynäkologie*, 1879, No. 25).

§ 956. The indications for Cæsarian section have already been pointed out. It is well to operate, where there is room for choice, while the membranes are still intact, since the child will then have suffered but little from the pressure of labour. But it is hardly possible to name *one particular moment in the period of dilatation as the most suitable*, since, where the space relations are abnormal, dilatation but too often does not progress in a normal manner. The principal point is that the uterine activity shall have led to vigorous contractions, since these afford us reason for hoping that, after the evacuation of the organ, rapid contraction and retraction will ensue, and that the hemorrhage will consequently be arrested. As soon therefore as the accoucheur thinks that the uterus has reached this condition, even if the os

uteri is but little dilated, he should wait no longer, for the liquor amnii may now be discharged at any moment, and this, although not exactly a serious complication, is nevertheless undesirable. Moreover when the labour is prolonged, the frequent examinations that are made, increase the risk of septic infection. Hence there is special reason in these cases for avoiding such, even before the operation.

If the parturient woman is under observation for a sufficiently long time before the operation, she should be kept rather short of food for a few hours. This diminishes the risk of the chloroform producing vomiting, a most annoying occurrence during laparotomy.

In private practice we are usually obliged to put up with the *bedroom*, such as it is; but at any rate it can be thoroughly aired, after which it should be filled with carbolic spray. Everything, which can come into contact with the abdominal cavity, must be most scrupulously *disinfected*. Further, the room must be properly *warmed*; Clay long ago drew attention to the important bearing that this matter has on the success of ovariectomy, and Wegner has shown why chilling of the open abdominal cavity is so dangerous; the temperature of the room ought to be from 22.5°—25° C. (73°—77° F.). The *operating table* must be firm, sufficiently high, narrow, and accessible on all sides; a table covered with a firm mattress, over which lies a warm linen sheet, answers best. The upper part of the woman's body should be slightly raised, and the sacrum well supported. In this position the body of the uterus is forced against the anterior abdominal wall.

Several *assistants* are required; one to give chloroform, one to retain the intestines *in situ* and to fix the uterus, one to attend to the carbolic spray, and to hand instruments to the operator. At a subsequent stage a nurse will be wanted to receive the child, and attend to its respiration. If there are other trustworthy persons at hand, they may help in steadying the woman; but amid the difficulties of country practice the accoucheur may have to manage with even fewer assistants.

The *instruments* required for the operation are few; several kinds of bistoury and scissors, directors, forceps, material for ligatures, carbolised silk, and new sponges which have been boiled in carbolic lotion; on no account must the wound be touched

with a sponge that has already been used. Further, there should be at hand a basin of ice, a pail of cold, carbolised water, another with warm carbolic water, in which the sponges and instruments lie, and additional warm carbolised water in which to rinse out the sponges. Lastly, there should be a sufficient quantity of very warm, 2—3 p. c., carbolic lotion for supplying the spray, which must work from the beginning of the operation until the bandages are finally applied, subject to the direction of the operator.

The *anæsthesia* must be deep, and prolonged during the entire operation. It is a good plan to begin by giving a subcutaneous injection of morphia, or by introducing ca. 5 cgrm. (gr. $\frac{1}{4}$) of pure opium *per rectum*. This greatly assists in maintaining a state of uniform narcosis, and diminishes the amount of chloroform required. It appears moreover to lessen the weakening after effects of the chloroform on the uterine contractions¹.

§ 957. The operation may be divided into *four acts*: 1. the opening of the abdominal cavity; 2. that of the uterus, including the extraction of the child; 3. the removal of the placenta, the arrest of hæmorrhage and the *toilette* of the abdominal cavity; 4. the closure of the wound and the application of bandages.

The abdominal walls should be incised along the linea alba (according to the so-called method of Deleurye), as indeed is done, with very few exceptions, in every case of laparotomy. Occasionally the abdominal cavity has also been opened by a lateral longitudinal incision (Levet), by a diagonal (Stein, *jun.*) and by a transverse incision (Lauverjat). Attempts have also been made to avoid incising the body of the uterus, by opening a way through the lower portion of the abdominal wall, through the vagina to the cervix, and incising both cervix and vagina (Jörg). Others again have recommended that an exit be found for the child in that region, without injuring the peritonæum (Ritgen, Thomas). With this latter object an incision is carried parallel to Poupart's ligament from

¹ Further observations are required, before we can decide as to the value, or as to the action on the uterus, of ethylidene chloride, which has lately been recommended in England. The mixture of oxygen and nitrous oxide, which has been suggested as an anæsthetic by Kliekowitzsch (*Archiv f. Gynækologie*, vol. xviii, 1881, p. 81) is not sufficiently reliable for a Cæsarian section, and is more troublesome than the use of chloroform; on the other hand its use is said to be unaccompanied by vomiting, and not to interfere with the uterine contractions. Local anæsthesia, produced according to Richardson's method, renders the incision into the abdomen a painless one, and calls forth uterine contractions by the cold it produces; but it will not suffice for the whole operation, since it cannot be used after the abdominal cavity has been opened. Moreover it prevents the use of antiseptic spray during the operation.

the right anterior superior iliac spine to just above the tubercle of the pubes; the muscles and fasciæ are then divided, and the peritoneum detached by the fingers. The vagina is now forced towards the superficial incision, either with a finger or a sound, and is then, in order to avoid the ureter, opened transversely at a distance of 3—4 cm. (1—1·5 in.) below the cervix, this incision being enlarged in both directions with the fingers. The uterus is next drawn forcibly to the left side, the os brought into the wound, and the child extracted through the latter, either directly with the hand, or by version or forceps, the placenta too being removed through the wound; the latter is united externally by sutures. During the lying-in period the iliac fossa is irrigated *ex vagina*. The results which accompany this operation of *laparo-clytotomy* are out of all proportion to its difficulty and danger. A most exact topographical knowledge of the pelvic organs is required, and even with such knowledge it is not easy to avoid injuring the bladder, ureter or great vessels. Moreover even if the operator succeeds, without incising the peritoneum, the latter will necessarily be extensively detached, stretched and bruised, while after all it is not certain that the fetus will be able to pass through the opening that has been made.

The operator stands on the right side of the woman, after having assured himself that the bladder is empty; his assistant stands *vis à vis*. By means of percussion, he now makes sure that there are no coils of intestine lying in front of the uterus, and, if they do so lie, pushes and presses them to one side. The assistant then washes the whole abdomen with carbolic lotion and soap, and places his two hands with the finger tips directed downwards one on each side of the uterus; he next brings the latter into the median line, so as to correspond with the linea alba, and pushes it against the abdominal walls and slightly forwards, without however unduly stretching the latter. The spray must now be turned on. The incision should begin 2—3 cm. (ca. 1 in.) below the umbilicus, and is to be carried down to within about 4 cm. (1·5 in.) of the symphysis; if necessary, it may afterwards be lengthened, by prolonging it upwards and to the left round the navel. The abdominal walls must be divided slowly, each bleeding vessel being twisted, temporarily compressed, or ligatured with carbolised silk or catgut, so that no blood may afterwards escape from the walls into the abdominal cavity. Only carbolised sponges are to be used in wiping the wound. If the peritoneum comes into view, a small portion is pinched up with forceps, then incised, and the peritoneum divided to the whole extent of the abdominal incision, under the guidance of the left index finger. Either a bistoury or scissors may be used.

The uterus will now come into view, and must once again be

brought exactly into the median line; while the hands of the assistant press it more firmly into the abdominal incision. The uterine wall is next incised, a gentle, warm spray being of course maintained. From this point the operation must proceed rapidly, for the hæmorrhage is tremendous; but the operator must not be disturbed either by the latter or by the irregular gaping of the fibrous surfaces of the incision. The latter must be at least 12 cm. (ca. 4½ in.) in length, to allow of the child being easily extracted; it should therefore be so made, as to end below in the neighbourhood of the isthmus¹. On getting near to the decidua, the wound should first of all be deepened in its upper half, until the membranes with, or without, liquor amni come into view. The index and middle fingers are next carried between it and the uterine wall, and the latter separated from the membranes for the whole length of the wound. The next step is the extraction of the child.

While the assistant does his best to push the uterus well forwards, and to press the edges of the abdominal wound against it (Winckel senior [*Monatsschrift f. Geburtskunde*, xvi., 1860, p. 402] advises that even now one finger be hooked into the upper angle of the uterine wound, so as to bring it into correspondence with the angle of the abdominal wound), the operator rapidly penetrates into the uterine cavity on the outer side of the membranes, ruptures the latter², seizes the head or the lower limbs, and deliberately extracts the child; with the head first is best, since the after-coming head is apt to be detained by the wound contracting round it, when the uterus is emptied; even this however is easy to overcome with a little skill and, if necessary, by enlarging the wound. If the amniotic fluid was discharged before the operation, or if the membranes were opened at the time of the incision, the fœtus, which then usually of its own

¹ The suggestion made by Säger (*Der Kaiserschnitt* &c., 1882, p. 186) and Kehrer (*l. c.*), that the incision in the lower uterine segment should be made transversely is well worthy of attention; partly because the wound gapes less after the uterus has been emptied, partly because the placenta is only exceptionally inserted there, partly also because the peritoneum at that point is more easy to separate, and can be better used to form a serous covering, when sewn together.

² The rupturing of the membranes *ex vagina* is a trivial matter, which uselessly prolongs and complicates the operation, at a moment when prompt action is necessary, it has however been recommended. The escape of the liquor amni into the abdominal cavity does not occur, when the membranes are opened in the wound, provided the assistant is up to his work: but even when such escape takes place, no harm results, so long as the fluid has not undergone decomposition.

accord projects into the wound, is seized at its proximal pole and extracted. No great harm results, if the membranes are taken hold of at the same time.

It is very unpleasant to meet with the placenta, while making the incision, nor is such an event rare, for that organ is frequently attached anteriorly. The condition will be recognised from the width of the incised surface, its very dark, spongy appearance and the enormous hæmorrhage, which indeed was already severe, when the subserous layers were being incised. Some operators have advised that in these cases the placenta should rapidly be detached from one side and the child extracted, but I have never been able to do so in the 3 cases in which I have been face to face with the complication. The placental tissue is difficult to distinguish from the uterine, and the finger bores into the spongy tissue and tears it, instead of separating it. The wiser course is therefore rapidly to divide the placenta with a knife, to expose the membranes and the fœtus, to prolong the incision and to extract; the more rapidly this is done, the less will be the hæmorrhage.

The child is now handed to the nurse appointed to attend to it, for the operator must direct his whole attention to the mother. He therefore rapidly ties and cuts the cord.

In order to discover the position of the placenta before making the incision, Hulbertsma (*Centralblatt f. Gynækologie*, 1881, No. 5) recommends that the anterior uterine wall be punctured with an exploratory trocar. If the placenta is encountered, only blood will flow; if missed, liquor amnii will appear, or else the fœtus will be reached and its movements felt.

The easiest way of preventing hæmorrhage and the escape of blood and liquor amnii into the abdominal cavity, is to adopt a modification which was suggested by P. Müller (*Centralblatt f. Gynækologie*, 1878, No. 5) for Porro's operation, and first of all practised by Litzmann (*Centralblatt f. Gynækologie*, 1879, No. 12) in an ordinary Cæsarian section. It consists in tilting the uterus out through the abdominal wound and then surrounding the uterus in the neighbourhood of the internal os with a loop of wire or (since this is apt to tear and to cut through the tissue) still better with an elastic tube (Litzmann, *Centralblatt f. Gynækologie*, 1879, No. 1); only when this has been done, is the uterus incised. But if this suggestion is adopted, the incision and evacuation of the uterus must be completed as speedily as possible, since the shutting off the maternal blood supply will very soon lead to premature breathing of the fœtus. The elastic tube is not taken off, until the uterine wound is completely closed by sutures.

§ 958. The intestines and omentum are very apt to protrude, as the uterus diminishes and the abdominal walls collapse, nor can pressure of the latter against the uterus be relied upon to

prevent such protrusion. The best plan therefore is for the assistant to keep the ends of the uterine wound in contact with those of the abdominal, both above and below. Or else he may push the whole uterus, like a tumour, out of the abdominal cavity, and close the latter, by holding the edges of the wound together behind the uterus. The last of these methods has all the more to recommend it, since during the interval between the removal of the placenta and the complete retraction of the uterus, a good deal of blood may still trickle out, and this does not get into the abdominal cavity, when the uterus is pushed forwards. If intestines protrude, they must at once be replaced by the operator, the assistant only moving, when directed to do so.

The placenta should be removed early, whether the uterus contracts energetically or not; in the latter case prompt removal is all the more urgent. This must be done gently, the placenta being drawn or peeled off¹.

The uterus may be allowed to remain for a little while outside the abdominal wound, until its firm retraction is insured. But if so, it must be covered with a warm, damp cloth, and exposed to a warm spray. If the organ continues large, or relaxes again and again, if it bleeds, or if there is any reason to fear recurrence of hæmorrhage, the wound in the uterus must be sewn up, this being the only reliable, curative and prophylactic measure². Indeed since hæmorrhage is liable to recur some hours and even days after the operation, I advise the operator *always* to close the wound, this plan moreover being the best safeguard against the subsequent transmission of wound or lochial secretions from the uterus into the abdominal cavity. An observation of Willigk (*Prager Vierteljahrsschrift*, 1873, vols. 2 & 3, p. 86—90) shows that the suture may also prevent subsequent mischief, *i.e.* imperfect healing of the wound; in his case a depressed cicatrix became inflamed at a subsequent labour, burst into the abdominal cavity, and caused death.

The various and frequently ingenious modes of suture, which

¹ Wigand advises that the placenta be removed *per vaginam*, and that with this object the umbilical cord be conducted at an earlier stage through the os into the vagina. The proposal is impracticable and useless.

² On no account ought the uterus to be covered with cloths or bags containing ice for a quarter of an hour or even longer, as is sometimes done with the object of provoking contractions. Such a practice is opposed to all the principles that govern intra-abdominal surgery.

have been devised, out of fear that sutures might be left behind in the peritoneal cavity¹, i.e. with the object of subsequently removing them, have now no longer any importance, since we know that ligatures may be left in the peritoneum, without causing irritation. The continuous button suture is the only one suited for sewing up these wounds; whether carbolised silk or wire is selected probably matters little, although as a general rule the first of these is least irritating. Catgut should on no account be used², since the rhythmical after-pains loosen and even undo its knots (this has happened to myself and others. (J. Tauffer and Martin *l. c. sub* "Literature.")

The number of the sutures depends on the extent of the wound and on the condition of the uterus; the more relaxed the latter, the more numerous must the sutures be. Deep sutures should be inserted at intervals of $2\frac{1}{2}$ cm. (1 inch), superficial ones being inserted between them. The former include the entire thickness of the wall, and ought especially to embrace a good deal of the external layers, since these gape most. The object of the superficial sutures is to bring the edges of the wound and the surfaces of the serosa together, in order to produce rapid agglutination of the latter, and completely to shut off the peritoneal from the uterine cavity (d'Avanzo, Sir Spencer Wells, Sanger). If the deep sutures take in too thick a layer, there will be a risk of their cutting through the tissues, when the uterus expands and thereby puts them on the stretch; and in time they will probably get loose, owing to the diminution of size of the organ. But before such a considerable diminution can occur (4, 5, or 6 days), the two sides of the wound ought to have become adherent³.

The subsequent gaping of the sewn up uterine wound is however, as Kaltenbach rightly observes, certainly not exclusively due to the alternating contraction and relaxation of the uterus and to its rapid diminution in size, but most of all to an infection of the surfaces of the wound preventing primary union.

¹ Cf. *inter alios* Barnes, *London Obstetrical Transactions*, xii., 1871, p. 863, and Sir Spencer Wells, *Medical Times*, Sept. 30, 1865.

² This was first used by Veit (*Berliner Beiträge z. Geburtshülfe und Gynäkologie*, iii., 1874, *Sitzungsbericht*, p. 45) and Birnbaum (*Deutsche Medicinische Wochenschrift*, 1876, No. 2).

³ In order to keep pace with the varying size of the uterus during the first few days after the operation, Valentinotti (*Gazette de Clin.*, Nov., 1873), Silvestri (cf. *Archives de Toccol.*, i., 1874, p. 189) and Stoltz (*l. c.*) have resorted to elastic sutures, composed of india-rubber threads covered with silk.

When the hæmorrhage is checked and the sutures have been inserted, the uterus must be returned into the abdominal cavity, the visceral and parietal peritoneum cleansed from the escaped liquor amnii and blood, sponges soaked in carbolic water being used (*toilette* of the peritoneum). The abdominal wound is next to be accurately closed with deep sutures, which embrace a good deal of tissue, and with intervening superficial sutures. The *permanent bandage* must be applied, after the patient has been thoroughly cleansed, as in the case of other laparotomies, and consists of antiseptic gauze applied to the wound, over that a broad layer of the same material with gutta-percha tissue and a thick layer of carbolised wool. Everything must be applied thoroughly warm, and finally fixed (but not too tightly) by a new flannel bandage, which passes several times round the abdomen. The woman must then have fresh linen, and be carried into a thoroughly warmed bed.

§ 959. The *after treatment* is a very important matter, although not a difficult one, if the operator is a skilful surgeon, and especially if he is familiar with the after treatment of ovariotomy, which is in the main similar to that of Cæsarian section. One great object is to keep the woman warm from the very first, so that a general reaction and perspiration may rapidly follow. Opium may be given in a suppository, or morphia subcutaneously, where there is colic, restlessness and nausea; for the latter bits of ice may be swallowed with advantage. Stimulants must be used, as occasion arises, and nourishment administered, according to necessity and constitution. The catheter must be passed every 6—8 hours, until the patient can micturate spontaneously and without effort. The bowels should not be allowed to act for 5 days, if possible, so as to keep the abdominal muscles quiet. The lochial discharge must be kept perfectly free, so that no stagnation or escape into the peritoneal cavity can occur. With this object it is a good plan to keep the uterine cavity constantly irrigated during the first few days, until it is likely that the cut surfaces have completely united, a weak (1 p. c.) solution of carbolic being employed. During such irrigation however a reliable person however ought to watch and see that the fluid flows out freely. If it should cease to do so, the irrigation must be discontinued, lest the fluid might escape into the abdominal cavity, if the uterine wound happened to be gaping. Where

permanent irrigation appears from the very first to be impracticable, the surgeon will do well (with a view of preventing the sewn up wound from being stretched by the repeated introduction of the uterine tube), at the time of the operation, to pass a drainage tube into the uterine cavity, and to irrigate through this, as necessity arises. The vulva should be covered with a large pad of antiseptic wool, so as at any rate to some extent to prevent the access of air. If the woman is vigorous, and the wound progresses favourably, she may nurse her child, since suckling favours the involution of the uterus. The bandages must not be changed for 3 or 4 days, unless demanded by urgent symptoms. The great advantage of closely fitting bandages, applied as above described, is that the patient need not be disturbed by their early and repeated renewal. The superficial sutures may gradually be removed after the 5th day; the deep ones after the 7th. I have not room here to discuss the question as to how the wound ought to be opened, when this becomes necessary, and drainage tubes inserted.

§ 960. The prognosis has already been referred to in § 954. The principal danger, apart from that of recurrent hæmorrhage, arises from the transference of septic matters from the uterine into the peritoneal cavity, and until recently we possessed no reliable means of preventing this. In the year 1876 however Porro¹ introduced his *method of extirpating the uterus*, the advantage of which is that the above-mentioned risk is entirely avoided. Porro's original operation differs from an ordinary Cæsarian section by the fact that the uterus, after being emptied, is drawn out of the abdominal wound, surrounded by a wire at its lower segment, and then cut away, together with its appendages. But the modification suggested by P. Müller, which has already been referred to in § 958, is a decided improvement on the original. The uterus is first ligatured as above described, then incised and emptied, and removed above the elastic band, the cut surfaces being sewn together in the way recommended by Schröder for myomotomy. The pedicle is next tied with silk, or still better with an elastic ligature (Olshausen), which both remains in closer contact, when the stump subsequently undergoes involution, and

¹ *U. Della amputazione utero-ovarica come complemento di taglio Cæsario.* Milan, 1876. (*Gy. Arch. Tirol.*, 1877, i., p. 349. (Godson, *British Med. Journal*, Jan. 26, 1881. —Tr)

acts as a preventive against recurrent hæmorrhage. When the elastic band (or the loop of wire) has been removed, the pedicle is allowed to sink back into the abdominal cavity. The abdominal wound is accurately sewn up, after a careful *toilette*.

The method of keeping the stump outside the peritoneum, *i.e.* sewing it into the lower angle of the wound, has the advantage that the uterine wound is kept outside the abdominal cavity, but cannot be recommended for general adoption, on account of the slowness with which the wound heals, and of the by no means small difficulty of avoiding suppuration in the end of the ligatured pedicle. But although on the whole it is less valuable than the intra-peritoneal method, yet in some cases it may be preferable to the latter, for instance when the uterine contents are decomposed at the time of the operation. Under such circumstances Hegar's procedure is the best (*Operative Gynecology*, 2nd ed. 1881 p. 432).

The mortality of Porro's modification of Cæsarian section has hitherto amounted to 54·4 p. c. (Sünger found 43 deaths amongst 79 operations). These figures are of course very unsatisfactory, although decidedly more favourable than those of the old Cæsarian section. It is true the latter as a general rule did not enjoy the blessings of antiseptics; but even with antiseptic treatment results have not been very different during the last few years. Porro's operation therefore has an undoubted advantage over the earlier method, in so far as it involves less risk to the mother. From another point of view however this advantage is dearly bought; the operation robs the mother of her power of reproduction, and cannot therefore be looked upon as the goal of our ambition. Nevertheless it must continue to be practised, until we have learnt how to avoid secondary hæmorrhage and the escape of lochia into the abdominal cavity in normal Cæsarian section.

Michaelis long ago recommended the complete removal of the uterus, and recently Rein gave the same advice (*Centralblatt f. Gynæcologie*, 1877, No. 65) Cavalieri having proved the possibility of its execution a hundred years ago, by experiments on lower animals. Storer (1868) actually performed this operation in a case where myomata also were present, although with an unfavourable result (*cf. supra* § 596, note 3). But Porro was the first who deliberately performed the operation on a normal uterus, and with the intentions detailed above. The less risk that accompanies the operation, unquestionably justifies its performance. Whether it is also admissible purely with the view of protecting the mother from future pregnancies is still under discussion. The same remark applies to Blondell's suggestion that the Fallopian tubes be cut through, and also to those of Frome and Koek, that their canals be obliterated by cauterisation of their orifices, in order to prevent future pregnancy. I am unaware whether any one has suggested or performed the simple extirpation of the ovaries with the same object.

§ 961. I need hardly mention that Cæsarian section must be carried out on a woman, who is *in articulo mortis*, entirely in the manner described in §§ 957 and 958. Even on the corpse it should never be allowed in any way to resemble a post-mortem examination.

In order to avoid perforation and Cæsarian section, Sigault in 1768, while still a student, suggested cutting through the symphysis, in order to widen the pelvis sufficiently to allow the passage of the child (*symphysectomy*, *synchondrotomy*), and this foolish proposal has, according to Morisani (*Annali di Ostetr.* 1881, Oct.; *Annales de Gynéc.*, 1881, Dec.), several times been performed; indeed it is still in vogue in Naples, where 50 operations have taken place between 1868 and 1880. Otherwise the operation has merely a historical interest. The space gained is very slight, especially in a sagittal direction, and beyond this, as Dieffenbach observed, "Death is the usual result, although abscesses, necrosis, caries, or at least an ununited condition of the symphysis, associated with paralysis, may occasionally be less serious sequelæ of the most successful cases." This verdict remains generally true, even though here and there there may be a somewhat more favourable result.

The *pubiotomy* recommended by Stoltz, and consisting in the subcutaneous division of the pubic bone close to the symphysis, is as obsolete as symphysectomy. Nor can one help regretting that Aitken ever made his proposal, viz. that of cutting through the entire pubic bone at the ends of its horizontal and descending rami, and afterwards healing the exposed ends of the bones (*pelviotomy*). Unhappily Galbiati and Ippolito (1832 and 1841) performed this operation, with, I need hardly add, the most lamentable results. "These operations must be ranked amongst the great mistakes of surgery."

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Appendix.

§ 962. *Forced delivery* (*accouchement forcé*) is not a distinct operation, but merely a combination of various operations, that have already been described, the term being applied to the rapid evacuation of the uterine cavity at a time at which the os is as yet insufficiently dilated to allow the hand to enter freely. The first step consists of the forcible dilatation of the os, after which the foetus is turned and extracted, and the placenta promptly removed. It will be obvious that this proceeding cannot be carried out, without serious lacerations resulting, except where the "pains" have already dilated the cervix to a certain extent, and the foregoing pages will have shown that I could only recommend it in certain cases of eclampsia and placenta prævia. As regards the *technique*, I need not do more than refer to the mode of dilating the os. It is the simplest matter in the world; the edges are gradually forced apart with one or two fingers, then with four, and lastly with the whole hand, and thus a path is made for the hand and for the descending foetus. When necessary, one, two or more lateral incisions through the edges may give assistance; whether made with scissors or a probe-pointed bistoury matters not. The practitioner may select whichever plan is found most convenient, but he should bear in mind that scrupulous and minute disinfection both before, and after, the operation is of great importance.

FINIS.



INDEX.

(The Roman Numbers refer to the Volume, the Arabic to the Page.)

A.	PAGE		PAGE
Abdomen, appearance of, in pregnancy	I. 141	Abdominal pregnancy, sequelæ	... I. 432
— auscultation of ...	I. 143	Abdominal pressure ...	II. 3, 6, 7
— circumference of, during pregnancy	... I. 160	— <i>cf.</i> also Abdominal muscles.	
— condition of, after delivery	... I. 305	— in pelvic contraction ...	II. 65
— examination of ...	I. 141	— premature use of ...	II. 19
— foetal, enlargement of ...	II. 169	— unduly strong ...	II. 18
— palpation of ...	I. 141	— weakness of ...	II. 17
— pendulous ...	I. 168, 219, 344, 463, II. 59, 65	Abdominal section, <i>cf.</i> Gastrotomy.	
— percussion of I. 143	— Cesarean section.	
— pigmentation of, during pregnancy	... I. 87	Abdominal tumours, <i>cf.</i> also Fibroid, Ovarian cyst, &c.	
— size of, during pregnancy	... I. 160	— — diagnosis from pregnancy ...	I. 157
— skin of, during pregnancy	... I. 81, 82, 162, 163	Abdominal walls, cleavage of ...	I. 482
— stræ of ...	I. 81, 82, 162, 163	— — during pregnancy ...	I. 81
Abdominal bandage, after delivery	... I. 265, 318	— — fissure of ...	II. 130
— — during normal labour	... I. 257	— — hypertrophy of, during pregnancy	... I. 81, 157
— — in anteversion ...	I. 385	— — increase of fat in, during pregnancy	... I. 81
— — in transverse presentation	II. 190	— — stræ of ...	I. 81, 82, 162, 163
— — in uterine inertia ...	II. 8	Aborted ovum I. 448
Abdominal binder, <i>cf.</i> Abdominal bandage.		Abortion ...	I. 448, 508
Abdominal cavity, anatomy of ...	I. 3	— acceleration of I. 522
— — bibliography ...	I. 7	— arrest of I. 521
— — boundaries ...	I. 3	— artificial II. 501
— — capacity ...	I. 5	— artificial, bibliography ...	II. 504
— — contents ...	I. 5	— artificial, <i>cf.</i> also Premature labour.	
— — description ...	I. 3	— artificial, for ovarian cysts ...	I. 406
— — dimensions ...	I. 5	— artificial, in chorea ...	I. 349
— — escape of fetus into	II. 278, 283, 298	— artificial, in retroversion of gravid uterus	... I. 395
— — extra-peritoneal ...	I. 6	— best time for inducing ...	II. 503
— — intra-peritoneal ...	I. 6	— bibliography of ...	I. 551
— — perforation of, in pelvic contraction	... II. 78	— carbolic acid in ...	I. 527, 528
— — shape of, during pregnancy	I. 4	— caused by anemia ...	I. 197
— — shape, normal ...	I. 3	— caused by destitution ...	I. 497
— — size of ...	I. 5	— caused by endometritis ...	I. 410
— — topography ...	I. 6	— caused by ovarian cyst ...	I. 404
— — walls of ...	I. 3	— caused by sexual excesses ...	I. 170
Abdominal muscles, action of, during labour	... I. 171, 177, 190, II. 3	— caused by syphilis ...	I. 364
Abdominal muscles, anomalies of ...	II. 3	— caused by uncontrollable vomiting	I. 342
— — sluggish action of	I. 261, II. 3, 6, 7	— caused by uterine fibroid ...	I. 399
Abdominal plates, <i>cf.</i> Muscle plates.		— caused by variola ...	I. 352
Abdominal pregnancy, <i>cf.</i> Extra-uterine ...	I. 419, 430	— causes ...	I. 170, 342, 352, 364, 399, 404, 410, 497, 508
— pregnancy, secondary ...	I. 431	— causing death from hæmorrhage	I. 517
		— causing inversion ...	I. 517, II. 290
		— causing tetanus ...	I. 517
		— commonest in multipare	... I. 510
		— complications of ...	I. 517
		— concealment of ...	I. 509, 510

	PAGE		PAGE
Abortion, criminal	I. 510	Accidental hæmorrhage	I. 57
— decomposition of foetal remnants		Accidents during irrigations	II. 40
— after	I. 527	— during irrigations, bibliography	II. 40
— definition of	I. 507	Accouchement forcé	I. 533, 544, II. 52
— diagnosis of	I. 518	— forcé in eclampsia	II. 12
— diseases calling for artificial	I. 339, 345, 349, II. 502	Accoucheur, armamentarium of I. 251, II. 10	
— due to atrophy of decidua	I. 448	Age of hearts—form of brain	II. 2
— due to placentitis	I. 470	Accephalic monsters	II. 17
— ergot in	I. 523, 525, 527	Acetate of lead, in abortion	I. 5
— followed by inversion	I. 517, II. 260	Acid, acetic, for hæmorrhage I. 519 II. 32, 3	
— followed by parametritis	I. 517	Acid, carbolic, <i>cf.</i> Carbolic	
— followed by perimetritis	I. 517	Acid, salicylic, as antipyretic	II. 17
— followed by retention of mem-		Acid, salicylic, in midwifery	II. 16
branes	I. 513	Acid, sclerotine	II. 1
— frequency of	I. 509	Acid, sulphuric, after severe hæmor-	
— habitual	I. 365, 388, 511	rhage	II. 24
— hæmorrhage in	I. 511	Acids in acute anaemia	II. 2
— in case of uterine cancer	I. 403	Acids in eclampsia	II. 219, 22
— in cholera	I. 354	Acorn	II. 7
— in continued fevers	I. 355	Adherence of chorion	II. 249, 25
— incomplete	I. 513	— of placenta	II. 24
— incomplete, bibliography	I. 511	— of placenta, postmortal	II. 25
— indications for artificial	II. 501, 502	— of placenta, signs of	II. 2
— induction of	II. 501	Adhesion of foetal membranes to	
— — for pernicious anaemia	I. 339	decidua	II. 15
— — for uncontrollable vomit-		Adhesion of fetus to placenta	II. 17
ing	I. 344	Adhesion of fetus to uterus	II. 17
— — in pelvic contraction	II. 90	Adhesion of labia	II. 14
— management of	I. 529	Adhesion of placenta to uterus	II. 24
— means of inducing	II. 495, 503	Adhesion, organic, of ovum to cervix	II. 15
— mechanical	I. 508	Adhesions, abnormal foetal	II. 17
— premonitory symptoms of	I. 512, 521	Adhesive inflammation of lips of	
— prevention of	I. 521	cervix	II. 15
— prognosis of	I. 517	Adipocere	I. 10
— prophylaxis of	I. 521	Ahnexa, <i>cf.</i> Membranes	
— recurrent	I. 497, 510	Adult, circulation in	III. 6
— recurrent, <i>cf.</i> Habitual		Aequabiliter juxta major pelvis	II. 2
— remnants left in uterus after	I. 513, 527	— juxta minor pelvis	II. 2
— septicæmia after	I. 515, 517, 527	Aeroductor	II. 12
— sequele of	I. 517	After-birth, period of the	I. 16
— shape of cervix during	I. 519	After-birth, period of the, months	
— simulated by dysmenorrhœa	I. 511	during	II. 1
— symptoms of	I. 511	After-birth period, management	I. 16
— tents in	I. 523, 527		II. 2
— time of occurrence	I. 509	After-coming head, application	
— treatment of	I. 529, 528	forceps to	II. 506, 5
— vaginal tampon in	I. 524	— — danger to	I. 2
Abcess, in puerperal fever	II. 440, 456	— — in pelvic contraction	II. 1
— of breast	II. 403, 407, 447	— — mode of extraction	II. 437, 4
— parametric	II. 456	— — perforation of	II. 1
Absolute pelvic contraction	II. 62, 581	After-pains	I. 292, 29
Absorption of liquor amnii after foetal		— anomalies	II. 22
death	I. 165	— effect on uterus	I. 292, 29
Acanthopelys	II. 50, 129	— prevention of	I. 29
Acardia in multiple pregnancy	I. 275	— provoked by suckling of child	I. 29
Acardine monsters	II. 176	Agalactia	II. 2
Acardiacus anceps	II. 177	Agaricus luteus	II. 40
Accelerator nerves, paralysis of	II. 357	Age, advanced, predisposing	
Accessory milk glands	I. 57	rupture of uterus	II. 10
Accessory orifices of Fallopian tube	I. 420	— fetal, how estimated	I. 115, 18
Accessory placenta	I. 111	Ague during lying-in period	I. 1
		— during pregnancy	I. 294, 2

- effect of parturition on ... 1. 356
 Atfield, on face presentations ... 1. 222
 Aute-forceps of Joulin ... 11. 555
 Air conductor ... 11. 539
 Air, effect of, in veins ... 11. 352
 — entrance of, into uterus ... 11. 344, 351
 — of, into uterus, bibliography ... 11. 349
 — of, into uterus, causes ... 11. 345, 351
 — of, into veins ... 11. 350
 — of, into veins, bibliography ... 11. 355
 — in stomach of fetus ... 11. 361
 — insufflation of, in asphyxia ... 11. 369, 372
 Austraetor, Simpson's ... 11. 556
 Air-vesicles, rupture of, bibliography ... 11. 19
 — rupture of, during labour ... 11. 19
 Acanthopelys ... 11. 50, 129
 Ala vesperilionis ... 1. 37
 Albumen in milk ... 1. 304
 Albuminuria, after delivery ... 11. 391
 — causing oedema during labour ... 11. 143
 — during pregnancy ... 1. 87, 345, 349
 — in eclampsia ... 11. 208, 209, 211, 216
 — in hydramnios ... 1. 463
 — in new-born child ... 1. 311
 — necessitating induction of
 abortion ... 1. 345
 Alcohol, for hæmorrhage ... 11. 238, 241, 296
 — in puerperal fever ... 11. 472, 473
 Alimentation, rectal ... 1. 344
 Alkalies in asphyxia ... 11. 355
 Albentosis ... 1. 93, 112, 133
 — anomalies of ... 1. 456
 — figure of early ... 1. 92, 94
 Atlantodes, two, in multiple preg-
 nancy ... 1. 275
 Alternation of living and dead fetus ... 1. 498
 Alum for hæmorrhage ... 11. 238, 296
 Amniosis, during eclampsia ... 11. 206, 209
 — during pregnancy ... 1. 349
 — in puerperal fever ... 11. 448
 Amblyopia, during eclampsia ... 11. 206
 — during pregnancy ... 1. 88, 349
 American pelvis ... 1. 23
 Ammonia, after hæmorrhage ... 11. 242
 — carbonate of, in eclampsia ... 11. 211
 — in treatment of asphyxia ... 11. 355
 Ammoniaemia in eclampsia ... 11. 211
 Amnio-chorionic fluid ... 1. 191, 182, 277, 412,
 460, 11. 185
 — fluid, excess of ... 1. 460
 Amnion ... 1. 92, 100
 — adhesions of, with fetus ... 1. 459
 — anomalies of ... 1. 459
 — cyst of ... 1. 460
 — development of ... 1. 421
 — figure of early ... 1. 92
 — pathology of ... 1. 459
 — rupture of ... 1. 460
 — separation from chorion ... 1. 449, 11. 137
 — tougher than chorion ... 1. 196
 — twists of, causing death of fetus ... 1. 460
 Amnions, two, in multiple pregnancy ... 1. 271, 273
 Amniotic bands, bibliography ... 1. 504
 — — causing amputation of limbs ... 1. 486
 Amniotic varuncles ... 1. 161
 — caruncles, hypertrophy of ... 1. 460
 Amniotic cavity ... 1. 93
 — — dropsy of, *cf.* Hydramnios.
 Amniotic fluid, *cf.* Liquor amnii.
 Ampulla of Fallopian tube ... 1. 33, 64
 Amputation of foetal limbs ... 1. 460, 486
 — of limbs by amniotic bands ... 1. 486
 — of limbs in utero, bibliography ... 1. 505
 Amyl. nitrite of, in tetanus ... 11. 489
 Anaemia, arterial, produced by ergot ... 11. 12
 — during chorea ... 1. 348
 — during pregnancy ... 1. 84
 — of brain in eclampsia ... 11. 212, 215
 — of lying-in woman ... 1. 321
 — of mother, causing death of fetus ... 1. 497
 Anaemia, pernicious, during pregnancy ... 1. 338, 350
 — — mortality from ... 1. 399
 — — necessitating abortion ... 11. 502
 — — treatment of ... 1. 339
 — treatment of acute ... 1. 534, 11. 240, 242
 Anæmic convulsions, diagnosis from
 eclampsia ... 11. 218
 Anaesthesia, *cf.* also Chloroform, Nar-
 cotics
 Anaesthesia, during labour ... 1. 266
 — — bibliography ... 1. 270
 — — operations ... 11. 487, 513, 518
 — — pregnancy ... 1. 88
 — — version ... 11. 513, 518
 — effect on pains ... 1. 267
 — local, Richardson's ... 11. 614
 Anasarca, *cf.* also Oedema.
 — in eclampsia ... 11. 206, 209
 — of fetus ... 11. 163
 — of fetus, bibliography ... 11. 203
 Anencephalic monsters ... 11. 176
 Aneurysm, aortic, causing dystocia ... 11. 170
 — of uterus ... 11. 382
 — rupture of, after delivery ... 11. 350
 Aneurysmal condition of vessel causing
 hæmorrhage ... 11. 232
 Animation, suspended, *cf.* also Asphyxia.
 — — definition of ... 11. 364
 — — treatment of ... 11. 367
 Ankylosis of coccyx causing dystocia ... 11. 136
 — of limbs of fetus ... 11. 177
 — of sacro-iliac joints ... 11. 93, 95, 105
 Anomalies of sexual organs ... 1. 374
 Annular laceration of portio vaginalis ... 11. 295
 — — — — bibliography ... 11. 295
 Ante-cervical hæmatoma ... 11. 298
 Ante-flexion of gravid uterus ... 1. 383
 Ante-partum hæmorrhage, *cf.* Hæmor-
 rhage
 Ante-uterine hæmatoma ... 11. 293, 298
 Anteversion of uterus during preg-
 nancy ... 1. 388
 Antimonium tartrate in uterine spasm ... 11. 20

- Antipyretics in puerperal fever II. 471, 472, 473
- Antiseptics in midwifery I. 252, II. 403
- — — *cf.* also Carbolic.
- Anuria in eclampsia ... II. 208
- Anus, condition during labour I. 182, 183
- traction by means of ... II. 545
- Aorta, aneurysm of, causing dystocia II. 170
- compression of, for hæmorrhage II. 239
- Aortic pressure in eclampsia II. 212, 215, 217
- Apnea, foetal ... II. 357
- of new-born child ... I. 133, 308
- prolonged duration of ... II. 364
- Apoplexy, a cause of asphyxia
- after delivery ... II. 350
- diagnosis from eclampsia ... II. 218
- due to eclampsia ... II. 209
- of decidua ... I. 448
- of placenta ... I. 468
- Apparatus, sexual, anatomy ... I. 29
- Appetite, during post-partum state ... I. 291
- during pregnancy ... I. 86
- Aqua picis as disinfectant ... II. 464
- Aqua picis in cystitis ... II. 393
- — — in skin diseases ... I. 346
- Aranzi, duct of, closure at birth ... I. 369
- Aranzi, ductus venosus ... I. 135
- Arbor vite ... I. 50, 75
- Arch, pubic ... I. 10
- Arcles, visceral ... I. 116
- Arciform ligament in pelvimetry ... II. 38
- Areus pubis ... I. 10
- Area, embryonic ... I. 90
- of expansion ... I. 71, 192, 534, 540
- of placental insertion ... I. 185
- Areola, changes in, during pregnancy I. 79, 157
- mammary, anatomy ... I. 56, 57
- phlegmon of ... II. 404
- secondary ... I. 79, 157
- umbilical, during pregnancy ... I. 88
- Argumentarium of accoucheur I. 251, II. 486
- Arm, dorsal displacement of ... II. 197
- presentation of ... II. 194
- prolapse of ... II. 194, 195
- — — diagnosis ... II. 195
- — — in transverse presentation II. 178, 184
- — — treatment ... II. 195, 341
- Arms, liberation of ... II. 162, 534, 535
- Arrowroot for new-born babe ... I. 329
- Arsenic in skin affections ... I. 346
- Arterial pressure affected by ergot ... II. 12
- — in eclampsia II. 212, 215, 217, 219
- — raised by pains ... I. 178
- tension in post-partum state ... I. 289
- Arteries, embolism of pulmonary II. 213, 350, 351, 352
- of uterus ... I. 50, 67
- ovarian ... II. 240
- umbilical, absence of the ... I. 482
- umbilical, atheroma of ... I. 480
- Arteriosus ductus Botalli ... I. 339
- Arteritis umbilicalis ... II. 473, 474
- Articulation, tho-sacral, ankylosis of II. 36
- — — inflammation of ... II. 36
- — — injury to ... II. 322, 324, 325
- — — rupture of, bibliography ... II. 32
- lumbosacral, injury to ... II. 32
- pelvic, injury to ... II. 32
- Articulations affected in puerperal fever ... II. 143, 144
- diagnosis of injury to pelvis ... II. 32
- of pelvis, changes in, during pregnancy ... I. 15, 18, 221, 30
- pelvic, injury to ... II. 32
- pelvic, rupture of ... II. 32
- pelvic, ruptured owing to perineal contraction ... II. 32
- pelvic, undue softening of I. 61, 62
- Artificial abortion ... II. 38
- abortion, bibliography ... II. 38
- abortion, *cf.* also Abortus
- feeding of infants ... I. 328
- premature labour ... II. 38
- respiration ... II. 328, 329
- rupture of membranes ... II. 32
- Ascites in foetus ... II. 60
- Asphyxia caused by air in veins ... II. 32
- caused by eclampsia ... II. 32
- caused by plugging of pulmonary artery ... II. 32
- Asphyxia, foetal I. 133, 216, 261, 671, II. 12, 27
- caused by delayed delivery II. 32
- caused by ergot ... II. 32
- caused by pelvic contraction II. 75, 6
- caused by twisting of cord ... I. 47
- in breech presentations ... I. 47
- in head presentations I. 216, 26
- livida ... II. 36
- neonatorum ... II. 36
- bibliography ... II. 34
- causes ... II. 34
- diagnosis of ... II. 34
- post-mortem appearance ... II. 34
- symptoms of ... II. 34
- treatment ... II. 34
- varieties ... II. 34
- pallida ... II. 34, 36
- Aspiration of air into uterus ... II. 34, 36
- of blood by foetus ... I. 28
- Aspirator, in treatment of ovarian tumours ... II. 36
- Ass, milk of she ... I. 3
- Asthma thyroideum ... I. 41
- Astringents, *cf.* Liquor ferri chloridi Acids, &c.
- Asymmetry of head after labour I. 21
- of pelvis, *cf.* also Pelvis oblique
- of pelvis, due to distention of uterus ... II. 12

- Asymmetry of sacrum, in Nagele pelvis I. 97
- Atelactases in fetus ... II. 366, 373
- Atheroma of umbilical arteries ... I. 480
- Atmospheric influences in eclampsia II. 205, 215
- Atony of placental site ... II. 230, 245
- — placental site, diagnosis ... II. 246
- — placental site, treatment ... II. 246
- — uterus ... II. 230
- — — causes ... II. 231
- — — due to hydramnios ... II. 231
- — — due to precipitate labour ... II. 37
- — — relative ... II. 232
- Atresia of cervix ... II. 131
- of cervix, bibliography ... II. 159
- of cervix, epithelia ... II. 135
- of genital canal ... II. 131
- of vagina ... II. 138, 300
- of vulva ... II. 141
- of vulva, bibliography ... II. 159
- vaginal, causing rupture ... II. 300
- Atropine during version ... II. 525
- in salivation of pregnancy ... I. 345
- in stricture of uterus ... II. 24, 248
- Atrophy of bones in rickets ... II. 48
- of decidua causing abortion ... I. 448
- of liver during pregnancy ... I. 357
- of pelvis due to dislocation of femur ... II. 126
- Attitude, abnormal, due to pelvic contraction ... II. 59
- fetal ... I. 127, 265
- — abnormal ... II. 59, 194
- — bibliography ... I. 138
- with transverse presentation II. 178
- of head, abnormal ... II. 86
- of head, diagnosis in contracted pelvis ... II. 83
- of woman, *cf.* also Posture, — of woman during pregnancy ... I. 83
- Auchenister, Scanlon's ... II. 603
- Aura, in eclampsia ... II. 221
- Aural presentations ... I. 219, II. 73, 74
- Auscultation in breech presentations ... I. 248
- in diagnosis of fetal position ... I. 208
- in diagnosis of life of fetus ... I. 161
- intra-vaginal ... I. 149
- of abdomen ... I. 141, 143
- of air in heart ... II. 352
- Australian pelvis ... I. 23
- Autochthonic coagulation ... II. 358
- Auto-genetic infection ... II. 421
- Autosepsis in puerperal fever ... II. 428
- Aveling's method of transfusion ... II. 243
- Axillary glands during lactation ... I. 301
- Axis, abnormal uterine, causing retention of placenta ... II. 249
- of bladder ... I. 39
- of pelvis ... I. 18
- of propulsion ... I. 19, 216
- of traction with forceps ... II. 572
- Axis traction forceps ... II. 556, 563
- B.
- Bacilli, *cf.* Bacteria. Micro-organisms.
- Back, injuries to, during extraction II. 547
- Bacteria in puerperal fever ... II. 426, 428, 442, 443, 444
- Bacteria, removal of, in puerperal fever II. 475
- Bag of membranes, *cf.* Membranes, bag of.
- Bag of waters, *cf.* Membranes, bag of.
- Bags, Barnes' ... I. 533, II. 49
- *cf.* also Barnes.
- elastic, in treatment of inversion II. 269
- india-rubber, for inducing labour ... II. 496, 499, 500, 501
- — — in uterine inertia ... II. 9, 10
- — — Tarnier's, *cf.* Tarnier.
- Ballotement of fetal head ... I. 206
- of fetus ... I. 142, 151
- Bandage, abdominal, after delivery ... I. 265, 318
- — *cf.* also Abdominal.
- — during pregnancy ... I. 108
- — in inertia ... II. 8
- — in transverse presentation ... II. 190
- pelvic ... II. 325, 326
- umbilical, for new-born child ... I. 325
- Bandages on varicose legs, risk accompanying ... II. 243
- Band on dilatation of cervix ... I. 74
- on obstetrical internal os ... II. 279
- on rupture of uterus ... II. 274
- Bands, amniotic ... I. 459
- amniotic, bibliography ... I. 504
- foeto-amniotic ... I. 459
- Baptism of living fetus ... I. 367
- Barnes' bags ... I. 533, II. 49
- bags, *cf.* also Bags.
- bags, for inducing labour ... II. 496, 499
- on perchloride of iron ... II. 238
- Bartholini, glands of ... I. 46
- Basilyst, Simpson's ... II. 598
- Baths before premature labour ... II. 495
- bidet ... I. 381, 414
- cold, as antipyretic ... II. 471
- during pregnancy ... I. 168
- for high fever ... II. 471
- for stimulating uterus ... II. 496
- steam, in uterine inertia ... II. 9
- Battledore placenta, *cf.* Insertio velamentosa.
- Baudelocque, callipers of ... II. 32
- cephalothryptor of ... II. 591
- diameter of ... I. 15
- Bayard, ecchymoses of ... II. 360
- Bearing down mechanism ... I. 177, II. 16, 18
- — *cf.* also Abdominal pressure.
- Bed for new-born child ... I. 326
- Bedding, infected ... II. 421
- Bed-room of lying-in woman ... I. 319
- Beer during lactation ... I. 823
- Belladonna, action on secretion of milk ... I. 321
- in phlegmasia alba dolens ... II. 388

- Benzoin in eclampsia ... 11. 223
- Bernard, forceps of ... 11. 555
- Bidet baths ... 1. 381, 414
- Bilin water in cystitis ... 11. 392
- Bilirubin in icterus neonatorum ... 1. 313
- Bimanual examination ... 1. 140, 151
- mode of version ... 11. 526
- Binder, abdominal, for hæmorrhage 11. 240
- *cf.* also Abdominal bandage.
- pelvic ... 11. 325, 326
- use of, after delivery ... 1. 265, 318
- Biparietal obliquity, *cf.* also Obliquity.
- obliquity of foetal head ... 1. 210, 218
- Bipolar version, *cf.* Version.
- Bladder, affected in puerperal fever 11. 446
- anatomy ... 1. 7, 39
- axis of ... 1. 39
- care of, during childbed ... 1. 319
- causing dystocia ... 11. 156, 169
- *cf.* also Cystitis.
- condition of, during labour ... 1. 254
- condition of, during pregnancy 1. 80, 345
- development of ... 1. 93
- diphtheritic inflammation of ... 1. 390
- disease of, after delivery ... 11. 390
- — bibliography ... 11. 396
- distended, causing convulsions 11. 217
- — causing face presentation ... 1. 222
- — causing inertia ... 11. 5
- — obstructing delivery ... 11. 156, 169
- — — bibliography ... 11. 169
- effect of pregnancy on ... 1. 80, 345
- gangrene of mucosa of ... 1. 390
- injury to, with impacted uterus 1. 380, 390
- injury to, with pelvic contraction ... 11. 72
- irrigation of, in cystitis ... 11. 393
- neuroses of ... 11. 393
- paralysis of, after delivery ... 11. 395
- puncture of ... 1. 395
- rupture of, during labour 11. 292, 301
- rupture of, owing to excessive distention ... 1. 391
- spasm of, after delivery ... 11. 393
- symptoms, with incarcerated uterus ... 1. 384, 389
- Blades, forceps, introduction of ... 11. 568
- — locking of ... 11. 570
- — parallelism of ... 11. 570
- — shape ... 11. 568
- — slipping of ... 11. 570, 577
- Blastoderm in case of twins ... 1. 273
- Blastodermic vesicle ... 1. 90
- — in case of twins ... 1. 272
- Blind's pills in hydramnia ... 1. 338
- Bleeding, *cf.* Hemorrhage.
- *cf.* Venesection.
- in plethora during pregnancy ... 1. 340
- Blennorrhæa, *cf.* Leucorrhœa ... 1. 414
- Blindness, colour, during pregnancy 1. 343
- Blisters in treatment of paralysis ... 11. 399
- Blood, aspiration of, by foetus ... 1. 262
- *cf.* also Anæmia, Plethora.
- changes in, causing disease ... 1. 137
- changes in, during pregnancy 1. 86
- Blood-cysts in mole ... 1. 450, 461
- Blood, decomposition of ... 11. 460
- effusions of, during delivery 11. 546, 547
- imperfect oxygenation of, *cf.* Asphyxia.
- impoverishment of, during pregnancy ... 1. 81
- Blood-mole ... 1. 448, 450
- Blood-pressure, effect of chloroform on maternal ... 1. 260
- — raised by "pains" ... 1. 175
- Blood, reserve ... 1. 262, 300
- reserve, importance to foetus ... 1. 262
- Blood-vessels, disease of ... 11. 39
- — entrance of air into ... 11. 346, 350
- Blot, perforator of, figure ... 11. 54
- Bunt hook ... 1. 224, 11. 594, 602
- — figure ... 11. 540
- — in breech extraction 11. 542, 543
- Body of uterus ... 1. 32
- Body-weight altered after labour ... 1. 291
- — effect on pelvis ... 1. 3
- — influence on rickety pelvis ... 1. 6
- — of child affected by infantia of cord ... 1. 260
- Body, Woldian ... 1. 4
- Boer's treatment of paralysis ... 1. 389
- Bone forceps in craniotomy ... 1. 380
- Bone, occipital, fractured by pelvic contraction ... 11. 568
- occipital, injuries to ... 11. 567
- parietal, fracture of, caused by pelvic contraction ... 11. 56
- Bones, atrophy of, in rickets ... 11. 48
- cranial, equitation of, in flat pelvis ... 11. 50
- disease of, in pelvic contraction 11. 50
- foetal, syphilitic changes in 1. 391, 404
- imperfect development in rickets 11. 47
- injury to foetal ... 11. 547
- of the pelvis ... 1. 7
- presentation of anterior parietal ... 11. 72
- — — posterior parietal ... 11. 73, 86, 87
- Bones, softening of, in osteomalacia ... 11. 413, 414
- — softening of, in rickets ... 11. 46
- Borax as oxytocic ... 11. 10
- Boring through of parturient canal ... 11. 271
- Botulus, duct of ... 1. 190
- duct of, contraction after birth 1. 300
- Bongie in inducing premature labour 11. 450
- useful in uterine inertia ... 11. 10
- Boundaries of the abdomen ... 1. 1
- Boxels, action of, post partum 1. 319, 320
- Brachycephalic head ... 1. 338, 339

- PAGE**
- Calculation of age of fetus by size ... 1. 115
 119, 161, 11. 491
 — of date of pregnancy ... 1. 65
 — of time of delivery ... 1. 158
 Calculi, placental ... 1. 473
 Calculus in vagina ... 11. 156
 — vesical, complicating labour... 11. 156 157
 — — — bibliography ... 11. 159
 Callipers ... 1. 161, 11. 32, 38, 40
 Callus causing pelvic deformity ... 11. 129
 — obstructing delivery ... 11. 326
 Calomel, *cf.* also Mercury.
 — in eclampsia ... 11. 222
 — in puerperal fever ... 11. 471, 475
 Camphor after severe hæmorrhage ... 11. 242
 — wine ... 11. 329, 474
 Canal, genital, atresia of ... 11. 134
 — — *cf.* also Genital, Parturient.
 — figure of ... 1. 28
 — rigidity of ... 11. 134
 — rigidity of, *cf.* also Rigidity.
 — ruptures of ... 11. 279, 277, 286, 293
 296, 299, 303, 306
 Canal of Neck... 1. 38
 — parturient, *cf.* Genital, Parturient.
 — pelvic, *cf.* also Pelvis ... 1. 25
 — perineal ... 1. 198
 Canabstition, *cf.* also Dilatation.
 — of cervix ... 1. 74, 175, 192, 194, 196
 — — *cf.* also Cervix.
 — — — in transverse presentations 11. 185
 Cancer, *cf.* also Carcinoma.
 — of cervix ... 11. 149
 — of cervix, bibliography... 1. 417, 11. 159
 — of cervix, during pregnancy ... 1. 492
 — of rectum... 11. 158
 — of uterus, bibliography 1. 417, 11. 159
 — of vagina... 11. 151
 — of vagina, bibliography ... 11. 151
 Cancerous growths obstructing pelvic
 canal ... 11. 128
 Cannabis Indica as oxytocic... 11. 13
 Caoutchouc pelvis ... 11. 113
 Capacity of abdomen ... 1. 5
 — of uterus for work ... 1. 191, 11. 67
 — vital, during pregnancy ... 1. 85
 Caputrahæ ... 11. 557
 — *cf.* also Fillet.
 Caput obstipum ... 1. 219
 — succedaneum after delivery ... 1. 310
 — — in breech presentations ... 1. 242
 — — in brow presentations ... 1. 204
 — — in contracted pelvis... 11. 61, 80
 — — in face presentations ... 1. 226
 — — in pelvic contraction 11. 61, 80
 — — in vertex presentations ... 1. 213
 — — primary ... 1. 182, 197, 202
 — — secondary ... 1. 183, 213, 11. 80
 — where formed 1. 182, 197, 202
 Carbolic acid in abortion ... 1. 527, 528
 — lotion in disinfecting vagina ... 1. 253,
 11. 464, 467
 Carbolic lotion after removal of pla-
 centa ... 11. 2
 — lotion after rupture of uterus ... 11. 2
 — oil ... 1. 28
 — spray in midwifery ... 11. 9
 — — — bibliography ... 11. 9
 Carbonate of ammonia in eclampsia... 11. 2
 Carbonic acid douche... 11. 43
 — acid during pregnancy ... 1. 8
 Carcinoma complicating pregnancy 1. 328 *cf.*
 — *cf.* also Cancer.
 — obstructing pelvic canal ... 11. 12
 — of rectum ... 11. 158
 Cardiac disease causing foetal anemia 11. 26
 — — during pregnancy ... 1. 351, 352
 — — — bibliography ... 1. 351
 Cardiac sounds altered during
 puerperal state ... 1. 229
 — — *cf.* also Heart.
 — foetal ... 1. 143, 146 147
 — foetal, in breech presentation 1. 242
 — foetal, in hydræmies ... 1. 46
 Carotids, compression of, in eclampsia 11. 27
 Cartilage, symphyseal, projection of 11. 4
 Caruncles, amniotic ... 1. 160 161
 Caruncle, hymenales ... 1. 48 49
 — myrtiformes ... 1. 48 49
 Cast on osteo-malacic pelvis 11. 115 11
 Casein, amount of, in milk ... 1. 49
 Cassell's fonticuli ... 1. 192
 Castor oil in eclampsia ... 11. 27
 — — in puerperal fever ... 11. 47
 — — post partum ... 1. 46
 Catamenia, *cf.* Menstruation.
 Catheter, passage of, during labour... 11. 15
 — use of, post partum ... 1. 50
 Catheterisation causing cystitis ... 1. 99
 — in cystitis ... 11. 322
 — of trachea ... 11. 368, 369, 372
 — of uterus... 11. 10, 221, 496, 497
 500, 501, 503
 Catheters ... 1. 251, 259
 Caudal fold of embryo ... 1. 76
 Caud ... 1. 149
 Caustery, galvanic, in extra-uterine
 gestation ... 1. 40
 — — *cf.* also Electricity, Galvanic
 caustery.
 Cavity of pelvis ... 1. 11 11
 — uterine, disinfection of... 11. 48
 Cells, physaliphorous... 1. 161
 Cellulitis, *cf.* Parametritis, Phlegmon.
 Central detachment of placenta ... 1. 359
 — perineal ruptures 11. 307, 309, 310
 — perineal ruptures, bibliography 11. 327
 Centre, injury to respiratory 11. 358, 362
 — motor, of uterus ... 1. 175, 176
 — of gravity during pregnancy ... 1. 87
 — of gravity of fetus ... 1. 42
 Cephalic fold of embryo ... 1. 20
 — — — — — 1. 174
 — — — — — 1. 172
 — — — — — 1. 172

	PAGE		PAGE
Cephalic lie, frequency of ...	1. 128	Cervix, occlusion of, in foetus ...	11. 169
— version, <i>cf.</i> also Version ...	11. 506, 515	— oedema of anterior lip ...	11. 303
— version in pelvic contraction ...	11. 90	— organic adhesion of, to ovum ...	11. 137
— version with prolapsed cord ...	11. 344	— papilloma of ...	11. 150
Cephalothrypsie répétée ...	11. 593	— plugging of, in abortion ...	1. 523
Cephalothrypsy ...	11. 592	— plugging of, in placenta prævia ...	1. 546
— bibliography ...	11. 600	— post-partum condition of ...	1. 305
— intra-cranial ...	11. 598	— prolongation of, <i>cf.</i> also Cervix, hypertrophy of ...	1. 380
Cephalothryptor ...	11. 586, 591, 599	— protrusion of, during pregnancy ...	1. 378
— Busch's ...	11. 593	— retraction of ...	1. 182
— description of ...	11. 592	— rigidity of ...	11. 134, 272
— dystocia due to shoulders ...	11. 161	— rubbed through by pelvis ...	11. 64, 271, 291
— in pelvic contraction ...	11. 89	— rupture of ...	11. 270, 275, 277, 286, 291, 293
Cephalotomy, <i>cf.</i> Craniotomy.		— rupture of, bibliography ...	11. 327
Cephalotube ...	11. 591	— shape of, in abortion ...	1. 518
— <i>cf.</i> also Cephalothryptor ...	11. 591	— shortening of ...	1. 73, 159, 164
Cephalothrypsy, <i>cf.</i> Cephalothrypsy ...	11. 592	— stenosis of ...	11. 134
Cervical fontanelle ...	1. 125	— stenosis of, bibliography ...	11. 137, 159
Cervicovaginate of, in uncontrollable vomiting ...	1. 343	— thrombus of ...	11. 320, 382
Cervical ganglion supplying uterus ...	1. 173	— ulcer of, causing hæmorrhage ...	11. 382
— myomata ...	11. 143, 145	— unsymmetrical expansion causing rupture ...	11. 275
— pregnancy ...	1. 431, 448	— varix of ...	1. 78, 11. 382
— vertebra, rupture of ...	11. 167	Chamberlen, forceps of ...	11. 553
Cervix, anatomy of ...	1. 31, 32, 49, 50	Chamomile enema in stricture of uterus ...	11. 248
— artificial dilatation of ...	1. 344, 11. 246, 496, 498	— tea in eclampsia ...	11. 222
— aspiratory action of ...	1. 64	— tea in uterine inertia ...	11. 9
— atresia of ...	11. 134	Chassagny, traction apparatus of ...	11. 555
— atresia of, bibliography ...	11. 137, 159	Chest, excessive size of ...	11. 161
— canalisation of ...	1. 71, 175, 179, 192, 194, 11. 185	— expansion of, at birth ...	1. 304
— cancer of ...	1. 402, 11. 149	— how affected by pregnancy ...	1. 86
— cancer of, bibliography ...	11. 159	Child, <i>cf.</i> Foetus, Infant.	
— changes in, during pregnancy ...	1. 72, 76, 155	Childbed, insanity during ...	11. 416
— contractions of ...	1. 164	— mortality in ...	11. 420
— cervical stenosis of ...	11. 137	— pathology of ...	11. 374
— dilatation of, by tents ...	11. 246, 496, 498	— sudden death during ...	11. 349
— — during pregnancy ...	1. 74	Chinese pelvis ...	1. 23
— — in uncontrollable vomiting ...	1. 344	Chloasma uterinum ...	1. 88
— epithelioma of, <i>cf.</i> Cancer ...	1. 402	Chloral during labour ...	1. 269
— erosion of ...	1. 64	— for stricture of uterus ...	11. 248
— erosion of ...	1. 413	— in chorea ...	1. 349
— fistula of ...	11. 303	— in eclampsia ...	11. 219, 221
— glands of, <i>cf.</i> Glands.		— in precipitate labour ...	11. 17
— hæmatocoele of ...	11. 320, 382	Chlorinated lime in colpitis ...	11. 474
— hæmatoma of ...	11. 320, 382	Chloroform ...	1. 252
— hæmorrhage from ...	11. 382	— contra-indications to use of ...	1. 268
— hypertrophied ...	1. 380, 11. 137	— during labour ...	1. 266
— hypertrophied, bibliography ...	1. 417	— — labour, bibliography ...	1. 270
— hypertrophy of anterior lip ...	11. 148	— — labour, effect on pains ...	1. 267
— — bibliography ...	11. 159	— — embryotomy ...	11. 606
— — with prolapse ...	11. 138	— — perforation ...	11. 585
— impaction of ...	11. 64	— — version ...	11. 513, 518
— injury to, in pelvic contraction ...	11. 78	— effect on foetal blood-pressure ...	1. 268
— inoculation of, dangers of ...	1. 252	— effect on fetus ...	1. 268
— involution of ...	1. 295	— excreted in urine ...	1. 268
— jamming of ...	11. 64	— in Cæsarian section ...	11. 613, 614
— lacerations of ...	11. 270, 277, 286, 291, 293	— — chorea ...	1. 349
— mucous membrane of ...	1. 50	— — eclampsia ...	11. 220
— obliteration of canal of ...	1. 179	— — examining abdomen ...	1. 143
		— — forceps operations ...	11. 367

- | | PAGE | | PAGE |
|--------------------------------------|---------------------------|--|----------------------|
| Chloroform in obstetrical operations | 11, 187, 513, 518 | Circulation in placenta | 1, 109, 133 |
| — — pelvimetry | 11, 41 | — — placenta, interference with | 11, 47 |
| — — podalic version | 11, 88 | — renal, in eclampsia | 11, 210 |
| — — precipitate labour | 11, 17 | Circulus venosus of Haller | 1, 4, 5 |
| — — structure of uterus | 11, 24 | Circumference of abdomen during pregnancy | 1, 100 |
| Chlorosis during pregnancy | 1, 338 | — of pelvis | 11, 50 |
| Choc en retour | 1, 365 | Clavicles, injury to, during labour | 11, 308 |
| Cholera during pregnancy | 1, 354 | Cleavage of abdominal wall | 1, 482 |
| — during pregnancy, bibliography | 1, 370 | — of ovum, <i>cf.</i> Segmentation | |
| — effect on lactation | 1, 355 | Climata, effect on menstruation | 1, 61, 62 |
| Cholesterol in lithopædon | 1, 433 | Clitoris | 1, 36, 36 |
| — in lochia | 1, 300 | — — hematoma of | 11, 319 |
| Chorea, causes | 1, 348 | Cloaca | 1, 93, 103 |
| — during lying-in period | 1, 348, 349 | Clot of blood plugging pulmonary artery | 11, 13 |
| — during pregnancy | 1, 347 | Clothes, disinfection of | 1, 102 |
| — during pregnancy, bibliography | 1, 350 | Clothing during pregnancy | 1, 100 |
| — in new-born child | 1, 348 | — during post-partum state | 1, 318 |
| — necessitating abortion | 1, 349, 11, 502 | — of new-born child | 1, 348 |
| — treatment of | 1, 349 | Coagula, discharge of, in abortion | 1, 399 |
| — urine in | 1, 348 | Coagulation, autochthonic | 11, 345 |
| Chorion | 1, 93, 99, 107, 133 | — spontaneous, causing death | 11, 350 |
| — adherence of, causing retention | | Coccyx | 1, 9, 11 |
| — of placenta | 11, 249, 252 | — ankylosis of, causing dystocia | 11, 130 |
| — adherence of, to uterus | 11, 252 | — dislocation of | 11, 130 |
| — anomalies of | 1, 451 | Coccyx in multipara and primipara | 1, 6 |
| — bibliography | 1, 137 | — in rickets pelvis | 11, 90 |
| — degeneration of villi of | 1, 451 | — recession of | 1, 17, 8 |
| — development of | 1, 421 | Cohen, perforator cephalotriety of | 11, 398 |
| — displacement of, on decidua | 11, 199 | Coiling of cord causing death | 1, 157 |
| — frondosum | 1, 100 | — — causing dystocia | 11, 201 |
| — hypertrophy of | 1, 451 | — — causing pelvic presentation | 1, 178 |
| — in multiple pregnancy | 1, 271 | — — round fetus | 1, 477, 11, 96 |
| — leave | 1, 100 | — — effect on position | 1, 132 |
| — myxoma of | 1, 451 | — — in face presentation | 1, 22 |
| — myxoma of, bibliography | 1, 504 | — — produces umbilical souffle | 1, 148 |
| — pathology of | 1, 451 | — — neck of fetus | 1, 120 |
| — rupture of | 1, 182, 196, 11, 137, 199 | Coitus | 1, 63, 65 |
| — ruptured without amnion | 11, 137, 199 | — after abortion | 1, 321 |
| — separation from amnion | 1, 449, 11, 137 | — causing erosion of cervix | 1, 143 |
| — villi of | 1, 100 | — date of, for fixing time of labour | 1, 158 |
| Chorioitis in puerperal fever | 11, 148 | — during pregnancy | 1, 159 |
| Cicatrix of cervix | 1, 164 | — effect on hymen | 11, 141 |
| Cicatricial atresia of genital canal | 11, 134, 139, 300 | — inducing uterine hemorrhage in placenta previa | 1, 307 |
| — atresia of vagina | 11, 138, 140 | Cold, <i>cf.</i> also Baths, Packing | |
| — atresia of vulva | 11, 141 | — in hemorrhage | 11, 235, 241 |
| — bands in vagina | 11, 138, 140 | — in puerperal fever | 11, 141 |
| — stenosis of vagina | 11, 139, 140, 300, 301 | Colic in new-born babe | 1, 428 |
| Cicatrix, rupture of uterus through | 11, 272, 278 | Collapse after delivery | 11, 349 |
| Ciliated epithelium | 1, 49, 52, 63, 419 | — due to hemorrhage | 1, 333, 11, 233, 241 |
| Cunabular passage of, into fetus | 1, 134 | — due to rupture of uterus | 11, 279, 281 |
| Chumnon as oxytocic | 11, 13 | — during childbed | 11, 344 |
| Circular rupture of partio | 11, 65 | — during delivery | 11, 79, 342 |
| Circular vein of uterus | 1, 68 | — in inversion of uterus | 11, 265 |
| Circulation, changes in, at birth | 1, 308, 309 | — of mother, causing fetal death | 1, 135 |
| — disorders of, during pregnancy | 1, 340 | Colloidum for ruptured perineum | 11, 344 |
| — effect of pregnancy on | 1, 85 | Colostrum | 1, 302, 322 |
| — in adult | Fig. 60 | Colostrumlike secretion in new-born child | 1, 380 |
| — in fetus | 1, 132 | | |
| — — fetus, diagram of | 1, 303 | | |
| — — new-born child, diagram of | 1, 308 | | |

	PAGE		PAGE
Colour blindness during pregnancy ...	1. 349	Constriction, tetanic, of foetus ...	11. 21, 186, 525
Colpeurynter ...	11. 497	Contagion, transmission of, from	
Colpeurynter in eclampsia ...	11. 224	mother to foetus ...	1. 135, 353
Colpitis ...	1. 77, 414, 11. 300	Contagious disease and practice of	
— bibliography ...	1. 418	midwifery ...	11. 463
— due to difficult labour ...	11. 79	Contents of abdomen ...	1. 5
— granularis ...	1. 77	— epigastrium ...	1. 6
— pustular ...	1. 414	— hypochondriac regions ...	1. 6
— vesiculosa emphysematosa ...	1. 414	— hypogastrium ...	1. 7
Colporrhoea ...	11. 158	— mesogastrium ...	1. 7
Colporrhoea during pregnancy ...	1. 414	Continued fevers during pregnancy ...	1. 355
Column, injury to spinal, during		— — — bibliography ...	1. 370
labour ...	11. 547	Contraction, pelvic ...	11. 26, 27, 58, 67
Columna rugarum anterior et		— — — — —	79, 91, 112
posterior ...	1. 47	— absolute ...	11. 62
Condensate of vagina ...	1. 47	— bibliography ...	11. 131
Conduits due to eclampsia ...	11. 204, 207	— Caesarian section with ...	11. 62, 610
Combined version, <i>cf.</i> Version.		— causing inertia ...	11. 65
Compressed fetus ...	1. 275	— causing injury to skull ...	11. 81
Compression of aorta for hæmorrhage ...	11. 239	— causing pressure marks on	
Concato, decupator of ...	11. 603	skull ...	11. 80, 81
Concealment of abortion ...	1. 509	— causing rupture ...	11. 78, 329
— of pregnancy ...	1. 510	— causing transverse presenta-	
Conception ...	1. 63, 65	tion ...	11. 181
— false ...	1. 449	— cephalothrypsy in ...	11. 89
— time of ...	1. 158	— course of labour with ...	11. 58
Condensed milk for new-born babe ...	1. 331, 332	— cranioclasm in ...	11. 81
Configuration, anomalous, of uterus, ...	11. 5	— dangers arising from ...	11. 66
— <i>cf.</i> also Moulding, Head.		— diagnosis of ...	11. 29, 32, 36, 41
Confinement, date of, how calculated		— effect on attitude of foetus ...	11. 59
— diagnosis of recent ...	1. 65, 158	— effect on bag of membranes ...	11. 62
Conformation of woman in diagnosing		— effect on cervix ...	11. 62
pelvic contraction ...	11. 30	— effect on factors of labour ...	11. 58
Confusion des membres ...	1. 282	— effect on pains ...	11. 65
Congestion of organs during men-		— effect on presentation ...	11. 59
struation ...	1. 61	— followed by eclipsis ...	11. 79
Conglutinatio orificii externi ...	11. 134	— followed by endometritis ...	11. 79
Conjugata, definition of ...	1. 12	— followed by fistula ...	11. 302
— diagonalis ...	1. 15, 11. 37	— followed by parametritis ...	11. 79
— externa ...	1. 15, 11. 31	— followed by phlegmon ...	11. 79
— externa, how measured ...	11. 34	— forceps required by ...	11. 84, 85
— externa, relation to interna ...	11. 34	— frequency ...	11. 29
— normal ...	1. 17	— kyphotic ...	11. 107
— of haudeloque ...	1. 15	— kyphotic, bibliography ...	11. 132
— vera ...	1. 12, 15	— kyphotic, <i>cf.</i> also Kyphotic.	
— — anatomical ...	1. 15	— mechanism of labour with ...	11. 67
— — angle formed with symphysis ...	11. 39	— mortality accompanying ...	11. 82
— — determination per abdomen ...	11. 36	— Nægele's, <i>cf.</i> Nægele.	
— — in contracted pelvis ...	11. 28	— oblique ...	11. 93
— — in flat pelvis ...	11. 46	— oblique, ætiology ...	11. 96
— — in Nægele pelvis ...	11. 96	— oblique, <i>cf.</i> also Oblique, Nægele.	
— — length of ...	11. 38	— oblique, diagnosis ...	11. 101
— — obstetrical ...	1. 15, 11. 38	— oblique, figure ...	11. 94
Conjugate, <i>cf.</i> Conjugata.		— oblique, labour in ...	11. 103
— true, <i>cf.</i> Conjugata vera ...	1. 12	— oblique, treatment ...	11. 101
Connective tissue of pelvis ...	1. 38, 43	— perforation in ...	11. 84, 85, 86
— tissue, parametric ...	1. 45, 78	— perforation in, <i>cf.</i> Perforation.	
Consciousness, loss of, in eclampsia ...	11. 206, 207	— prognosis ...	11. 77
Constipation during pregnancy ...	1. 81, 169, 345	— rare forms of ...	11. 91
— during puerperal state ...	1. 291	— relative ...	11. 83
		— rickety ...	11. 44, 46, 53, 56
		— Robert's ...	11. 485

	PAGE		PAGE
Contraction, pelvic, Robert's, <i>cf.</i> also Robert.		Corrosive sublimate in skin affections	1, 340
— sequelæ for child ...	11, 78, 79	— in syphilis ...	1, 342
— sequelæ for mother ...	11, 77	Corsets during pregnancy ...	1, 168
— treatment of ...	11, 82	Cotyledons of placenta ...	1, 100
— unilateral ...	11, 93	Cough in new-born child ...	11, 368
— unilateral, <i>cf.</i> Nægele, Oblique.		Cow, entrance of air into veins of ...	11, 320
— varieties ...	11, 61	Cow's milk, characters of ...	1, 329
— varieties, <i>cf.</i> also Pelvis.		— milk, for infant ...	1, 329
— version in ...	11, 87, 88, 517	Cowper's glands ...	1, 329
— version in, <i>cf.</i> also Version.		Cracked nipples, <i>cf.</i> Nipple.	
— uterine, hour-glass ...	11, 247	Cramp during pregnancy ...	1, 87
— vaginal ...	11, 138	— uterine, <i>cf.</i> Spasmodic.	
— vaginal, <i>cf.</i> also Vagina.		Cranial bones, <i>cf.</i> also Cranium.	
Contractions, uterine ...	1, 175, 178, 203	— bones, cracking of ...	1, 397
— anomalous ...	11, 3	— bones, displacement of, pelvic contraction ...	1, 81
— anomalous, bibliography ...	11, 25	— injuries to, during extraction ...	1, 81
— causing vomiting ...	1, 179	— relative displacement during labour ...	1, 214, 11, 81
— during labour ...	1, 174	— undue mobility of ...	1, 106
— during labour, duration of ...	1, 176	Cranioclast ...	11, 586, 590, 591
— during labour, nature of ...	1, 175	— advantages of ...	11, 586
— during pregnancy ...	1, 69, 156	— Braun's ...	11, 590
— effect of chloroform on ...	1, 267	— description of ...	11, 589
— effect on blood-flow ...	1, 69	— in pelvic contraction ...	11, 81
— blood-pressure ...	1, 178	Craniotomy ...	11, 579, 591
— distribution of blood ...	1, 202	— bibliography ...	11, 589
— fetal pulse ...	1, 147, 203	— <i>cf.</i> also Perforation.	
— maternal pulse ...	1, 178	— forceps ...	11, 590
— muscular fibres ...	1, 192	Cranium, alterations in shape due to labour ...	1, 214
— respiration ...	1, 179	— asymmetry of ...	1, 214
— shape of fetus ...	1, 190	— <i>cf.</i> also Cranial bones.	
— temperature of body ...	1, 178	— fetal, <i>cf.</i> Fetus, Skull	
— temperature of uterus ...	1, 179	— fracture of ...	11, 16, 47
— urinary secretion ...	1, 179	— injury to, during labour ...	11, 16, 47
— in hydramnios ...	1, 165	— shape of, in anterior parietal presentations ...	1, 217
— painful ...	11, 8	— shape of, in breech presentations ...	1, 242
— post partum, <i>cf.</i> After-pains.		— shape of, in brow presentations ...	1, 231
— too feeble ...	11, 5	— shape of, in face presentations ...	1, 227
— too strong ...	11, 4, 16	Cream for new-born babe ...	1, 344
— with pelvic contraction ...	11, 65	Credé's mode of expressing placenta ...	1, 261
Conversion of innocent into pathogenic germs ...	11, 129	Crepitation at pelvic points ...	1, 115
Convulsions, anæmic ...	11, 233	— <i>cf.</i> also Emphysema.	
Convulsions due to distended bladder	11, 217	— of decomposed fetus ...	11, 184
— eclamptic ...	11, 204, 215	Crest, pubic, unusual sharpness of ...	11, 179
— eclamptiform ...	11, 216	— sharp pubic, <i>cf.</i> also Spinous.	
— in new-born child ...	1, 315	— sharp pubic, injuring uterus ...	11, 220
Cord, spinal, <i>cf.</i> Spinal.		Crests, iliac, distance apart ...	1, 9, 11, 52
— umbilical ...	1, 112, 475, 505	Cretinoid habitus ...	11, 73
— umbilical, <i>cf.</i> Umbilical cord.		Criminal abortion ...	1, 549
Cornutium secale ...	11, 11	Crista ili ...	1, 9, 11, 32, 53
Coronal suture ...	1, 124	Crotch, <i>cf.</i> Hook	
— <i>cf.</i> Suture.		Croton oil in eclampsia ...	11, 222
— vessel of placenta ...	1, 110, 166	Crowning period of ...	1, 182
Coronary vein of placenta ...	1, 110	Cruel bernin ...	1, 382
Corpora cavernosa ...	1, 30, 46	Crushing of placenta ...	1, 349
Corporeal myomata, <i>cf.</i> also Fibroid	11, 143	Cry, fetal, before delivery ...	11, 362
Corpse, virus of, and puerperal fever	11, 127	Cul de sac of vagina ...	1, 35
Corpus albicans ...	1, 63	Valvula of uterus ...	1, 320
— luteum ...	1, 62, 66		
— luteum verum ...	1, 63		
Corrosion of uterus by hæmorrhages ...	11, 234		
Corrosive sublimate for intertrigo ...	1, 320		

	PAGE		PAGE
as proligerus	1. 54, 419	Death of fetus, habitual	1. 497
in tetanus	11. 483	— — — habitual, and premature	1. 497
fenestrated	1. 526, 527	labour	11. 492
ire	1. 526	— — — habitual, cf. also Habitual	
ures of bones in rickets	11. 47	— — — results of	1. 493
ures of fetus	1. 435, 11. 177	— — — signs of	1. 493
inal, accompanying pelvic con-		Death of mother during childbed	11. 349,
traction... ..	11. 31	355	
inal, causing pelvic deformity	11. 97	— — — during labour	11. 349
ous diseases due to syphilis	1. 491	— — — during pregnancy	1. 367, 371
seases during pregnancy	1. 346	— — — one of twins	1. 274, 278
nniotic	1. 460	— rate, how affected by frequent	
ydatal, causing dystocia	11. 158	operations	11. 2
endometritis	1. 440	— sudden, bibliography	11. 355
ammary	11. 409, 411	— sudden, during labour and	
arian, cf. also Ovarian cyst.		childbed	11. 349
arian, effect on labour	11. 152	Decapitating hook, Braun's	11. 602
arian, puncture of	11. 153	Decapitation	11. 193, 602
arian, treatment during labour	11. 153	— bibliography	11. 606
accidental	1. 472	— mortality after	11. 603
ablical	1. 181	Decapitator, Concato's	11. 603
degeneration of kidneys	11. 169	Decidua	1. 95
ygromata	11. 170	— abnormal structure of, causing	
ary, prolapse of	11. 154	adhesion of placenta	11. 250
amours, cf. Cyst.		— adhesion of membranes to	11. 136
amours, diagnosis of	11. 166	— anomalies of	1. 447
after delivery	11. 390	— apoplexy of	1. 448, 504
der delivery, bibliography	11. 396	— atrophy of	1. 447
se to incarceration of uterus	1. 389	— detachment of	1. 508
puerperal fever	11. 446	— discharge of, in extra-uterine	
rosa	11. 390, 395	pregnancy	1. 439
ata, ovarian, cf. Ovarian cyst.		— discharge of, without labour	1. 512
ple	1. 381	— figures showing development	1. 95, 96,
agnosis of	11. 157	97	
agnal, causing dystocia	11. 156	— graviditatis	1. 67
D.			
on tetanus	11. 482	hemorrhage into	1. 448
delivery, how calculated	1. 158	— hemorrhage into, bibliography	1. 504
pregnancy, how calculated	1. 65, 158	hyperplasia of	1. 409
as during pregnancy	1. 81, 88	— hypoplasia of	1. 447
new-born child	1. 315	— in extra-uterine pregnancy	1. 421, 436
due to embolism of pulmonary		439	
artery	11. 354	— in multiple pregnancy	1. 271
om drowning, signs of	11. 361	— menstrualis	1. 60
tra-uterine and puerperal		— pathology of	1. 447
fever	11. 431	— reflexa	1. 95, 99
fetus, causes	1. 351, 491, 497	— reflexa, absence of	1. 448
— diagnosis of	1. 164	— reflexa, atrophy of	1. 447
— due to amnion	1. 460	— reflexa, hemorrhage into	1. 449
— due to coiling of cord	1. 477	— reflexa, in multiple pregnancy	1. 271
— due to disease of placenta	1. 471	— relations at time of birth	1. 185
— due to infectious disease	1. 351	— retention of, in abortion	1. 513
— due to knots of cord	1. 477	— serotina	1. 97, 106
— due to syphilis	1. 491	— serotina, hemorrhage into	1. 449
— during delivery	11. 356	— serotina, invasion of, by chorion	1. 454
— effect on attitude	1. 428	— vera	1. 95, 97
— effect on liquor amnii	1. 165	— vera, hemorrhage into	1. 449
— effect on mammary glands	1. 165	Decidual cells	1. 97
— effect on uncontrollable		— endometritis, cf. Endometritis.	
vomiting	1. 342	Decomposition of fetus and puer-	
		peral fever	11. 431
		— of fetus causing physometra	11. 347
		— of fetus during labour	11. 347

	PAGE		PAGE
Decomposition of remnants of placenta	11. 380	Delivery, precipitate, treatment	11. 47
Deferred labour	1. 161	— protracted and puerperal fever	11. 490
Definition of Midwifery	I. 1	— retraction of uterus after	1. 263
Deformities, <i>cf.</i> also Fetus, Pelvis.		— through contracted pelvis	11. 56
— of fetus	1. 485	— — — bibliography	11. 133
— — fetus due to amniotic bands	1. 359	Depressed nipples	1. 162, 220
— — fetus due to coiling of cord	1. 478	Derivatives in stricture of os	11. 31
— — pelvis	11. 25	Descent of testes	1. 119
— — — bibliography	11. 131	Desire, sexual, during menstruation	1. 42
— — — <i>cf.</i> also Pelvis.		Desquamation in new-born child	1. 312
— — — due to exostoses	11. 128	— postponed by icterus	1. 434
— — — due to fractures	11. 129	Detachment of placenta 1. 185, 11. 228, 233, 265, 257	
— — — due to tumours	11. 128	— of portio	11. 65, 256
Degeneration of chorion	1. 451	— of uterus	11. 258, 260
— of uterine tissues	11. 5	Deutsch on version	11. 525, 526
Delayed delivery, <i>cf.</i> Dystocia.		Development, errors in, bibliography	1. 117
— — due to inertia	11. 6	— imperfect, in rickets	11. 47
— — due to pelvic contraction	11. 61	— imperfect, of sexual organs	1. 352
Delirium during delivery	11. 176	— of bladder	1. 93
Delivery	1. 174, 188	— brain	1. 129
— by spontaneous evolution	11. 186	— ears	1. 118
— — version	11. 184	— embryo	1. 9, 114
— — — version, bibliography	11. 203	— eyes	1. 159
— care of woman after	1. 316	— — generative organs	1. 114
— <i>cf.</i> also Parturition.		— head	1. 117
— collapse during	11. 349	— limbs	1. 117
— corpore concludicato	11. 186, 189	— mammary secretion	1. 150
— — bibliography	11. 189	— mouth	1. 116
— — treatment	11. 190	— muscle	1. 118
— delayed, <i>cf.</i> Dystocia.		— nails	1. 118
— diagnosis of recent	1. 305	— nervous system	1. 98
— forced	1. 533, 544, 11. 625	— nose	1. 118
— forced, in eclampsia	11. 224	— ovum	1. 98
— obstructed by abdominal swellings in fetus	11. 169	— ovum in extra-uterine pregnancy	1. 102
— — aneurysm of fetus	11. 170	— — sense organs	1. 99, 118
— — ascites in fetus	11. 169	— — sexual organs	1. 118
— — callus	11. 326	— — shape of pelvis	1. 119
— — cystic kidneys	11. 169	— — skin	1. 91
— — distended bladder	11. 156, 169	— — teeth	1. 114
— — distention of uterus	11. 169	— — twins	1. 271
— — fetal inclusion	11. 170	Diabetes co-existing with hydramnios	1. 162
— — haematoma	11. 317	— during pregnancy	1. 47
— — hydrothorax in fetus	11. 169	— during puerperal state	1. 290
— — monsters	11. 172	Diagnosis between a first and a subsequent pregnancy	1. 162
— — new formations	11. 143	— of death of fetus	1. 164
— — ovarian tumour	11. 152	— — period of pregnancy	1. 162
— — retained testicle	11. 170	— — pregnancy	1. 161
— — rigid hymen	11. 142	— — primiparity	1. 161
— — rigid perineum	11. 142	— — sex before birth	1. 160
— — thrombus	11. 317	— — time of delivery	1. 160
— — tumours	11. 143, 170	Diagonal conjugate	1. 15, 11. 8
— — unusually broad shoulders	11. 161	Diameter, <i>cf.</i> also Conjugata.	
— — vaginal hernia	11. 155	Diameter of Baudelocque	1. 18
— precipitate	11. 16	Diameters of fetal head	1. 12
— — causing atony	11. 18, 231	Diameters of great pelvis	1. 9, 11. 5
— — causing inversion of uterus	11. 18	— of small pelvis	1. 12, 11. 11, 37, 50
— — causing prolapse of uterus	11. 18	Diaphoretic in eclampsia	11. 222, 25
— — causing rupture of cord	11. 18	Diaphragm, action of, during labour	1. 17
— — effect on fetus	11. 18, 18		

	PAGE
bagin, effect of uterus on ...	1. 72, 86
of pelvis ...	1. 25
capture of, after delivery ...	11. 350
case in puerperal fever... ..	11. 453
of new-born babe ...	1. 329
cost partum ...	1. 349
case of recti causing inertia ...	11. 6
— during pregnancy ...	1. 81, 342, 344
case, hæmorrhagic ...	1. 339
ruptor, Delot's ...	11. 598
diatryptor of ...	11. 598
in back on perineal ruptures ...	11. 310, 313
laring child-bed ...	1. 320, 323
effect on milk ...	1. 305
of lying-in woman, bibliography ...	1. 303
of new-born child ...	1. 328, 333
inches in pelvis due to race and sex ...	1. 22
at labours ...	11. 1, 3
— cf. also Dystocia.	
tion, disorders of, during pregnancy ...	1. 341
effect of pregnancy on ...	1. 86
in new-born children ...	1. 311, 316
tive ferment in new-born child ...	1. 311
al examination ...	1. 149
alis as antipyretic ...	11. 473
as oxytocic ...	11. 13
in cardiac disease ...	1. 360
in insanity ...	11. 419
ability of pelvis in osteo-malacia ...	11. 116, 117
of split pelvis ...	11. 131
ation, cf. also Canalisation.	
duration of period of ...	1. 187
of cervix during pregnancy ...	1. 74
— for inducing pains ...	11. 496, 498
of os during labour ...	1. 175, 192, 196
of os in uncontrollable vomiting ...	1. 344
of parturient canal ...	1. 179
of parturient canal, cf. also Canalisation, Parturient.	
of pelvis ...	1. 12, 13
of urethra ...	11. 394
period of ...	1. 179
period of, management ...	1. 255
stage, delay during ...	11. 6
stage, inertia during ...	11. 6
or, Busch's ...	11. 394
Turner's uterine ...	11. 496, 499, 500
insions of uterus during pregnancy ...	1. 68, 69
of uterus in virgin ...	1. 68
theuric inflammation of bladder ...	1. 390
membrane in puerperal fever... ..	11. 435, 437, 454
large, lochial, cf. Lochia ...	1. 299
of liquor amnii, cf. Liquor amnii.	
serous, cf. Serous,	

	PAGE
Discharge, serous, during pregnancy ...	1. 165, 411
Discus proligerus ...	1. 51, 419
Diseases complicating pregnancy ...	1. 336, 350
— ague ...	1. 356
— albuminuria ...	1. 337, 346, 347
— amaurosis ...	11. 208, 216, 217
— amblyopia ...	1. 349
— anaemia ...	1. 338
— cardiac diseases ...	1. 358
— cholera ...	1. 354, 370
— chorea ...	1. 347
— complicating pregnancy ...	1. 336, 350
— constipation ...	1. 169, 345
— diarrhoea ...	1. 345
— dropsy ...	1. 340
— eclampsia ...	11. 204
— endometritis ...	1. 353
— enteric fever ...	1. 355
— epilepsy ...	1. 349
— hæmophilia ...	1. 339
— herpes ...	1. 347
— hydræmia ...	1. 337
— icterus ...	1. 351, 357
— impetigo ...	1. 346
— infectious diseases ...	1. 351
— insanity ...	11. 415
— intermittent fever ...	1. 356
— jaundice ...	1. 351, 357
— malarial fever ...	1. 356
— measles ...	1. 354
— nephritis ...	1. 346, 11. 208, 216
— nephritis, bibliography... ..	1. 350
— pernicious anaemia ...	1. 338
— phthisis ...	1. 362
— pneumonia ...	1. 361, 362
— relapsing fever ...	1. 355
— scarlatina ...	1. 353, 370
— small-pox ...	1. 352
— small-pox, bibliography ...	1. 370
— syphilis ...	1. 351, 364, 371
— tuberculosis ...	1. 351, 362, 371
— typhoid ...	1. 355
— typhus ...	1. 355
— uncontrollable vomiting ...	1. 341, 350
— variola ...	1. 352, 370
Disinfectants in midwifery ...	11. 464
Disinfection of hands... ..	1. 253
— genital canal... ..	1. 252
— instruments ...	1. 252
— uterus in puerperal fever ...	11. 468
— vagina during labour ...	1. 252, 11. 464
— vagina in puerperal fever ...	11. 467
— personal, after exposure to infection ...	1. 252, 11. 463
Dislocation of coccyx obstructing labour ...	11. 130
— of femur causing pelvic deformity ...	11. 98, 124
— of lumbar vertebrae causing spondylolisthesis ...	11. 123
Dislocations, intra-uterine ...	1

- | | PAGE | | PAGE |
|---|------------------------|--|---------------|
| Dislocations produced during labour | II. 551 | Dropsy of foetus causing dystocia | II. 193 |
| Displacement, dorsal, of arm | II. 197 | — of pregnant woman | II. 194 |
| — of cranial bones during labour | I. 214, II. 81 | Drowning, signs of | II. 391 |
| — — os uteri | II. 136 | Drugs eliminated by the milk | I. 595 |
| — — uterus | I. 377, 386 | Drunkennes, diagnosis from eclampsia | II. 219 |
| — — <i>cf.</i> Anteversion, Prolapse, &c. | | Duct, lactiferous, plugging of | I. 533 |
| — — in extra-uterine preg- | | — milk | I. 535 |
| nancy | I. 437 | — omphalo-enteric | I. 52 |
| — — post partum | I. 317 | — <i>cf.</i> also Duct vitello-intestinal | |
| — — vagina | I. 377 | — vitelline | I. 54 |
| Distantia cristarum | I. 9, II. 32 | — vitello-intestinal | I. 92, II. 62 |
| — — in flat pelvis | II. 46 | Ductus arteriosus, <i>cf.</i> Ductus Botalli | |
| — — in normal pelvis | I. 9 | — Botalli | I. 186, 66 |
| — sacro-cotyloidea | I. 13, II. 40 | — venosus Aranzi | I. 13, 53 |
| — spinarum | I. 9, II. 32 | Duncan, Matthews, on area of ex- | |
| — — in flat pelvis | II. 46 | pansion | I. 75 |
| — — in normal pelvis | I. 9 | — — on duration of pregnancy | I. 56 |
| — — ischiorum | I. 13 | — — on expulsion of placenta | I. 56 |
| — — post. | I. 15 | — — on inversion of uterus | II. 207, 208 |
| Distention of bladder, <i>cf.</i> also Bladder, | | — — on strength of membranes | II. 208 |
| dystocia | II. 169 | Duplication of genital canal | I. 572 |
| — of uterus, excessive, causing atony | II. 231 | Duration of labour | I. 186, 187 |
| — of uterus of foetus causing dys- | | — — affected by development | I. 187 |
| tocia | II. 169 | — — affected by sex of foetus | I. 187 |
| Distortion, oblique pelvic | II. 93, 95 | — — increased by pelvic con- | |
| Disuse of limb causing pelvic defor- | | traction | I. 61 |
| mity | II. 98 | — — — prediction of | I. 294 |
| Diuretics in eclampsia | II. 219, 223 | — — — with face presentations | I. 295 |
| Diviseur céphalique, Joulin's | II. 598 | Duration of menstruation | I. 43 |
| Dohrn, effect of pregnancy on | | — pregnancy | I. 94, 95 |
| diaphragm | I. 86 | — — sexual maturity | I. 62 |
| Dolichocephalic head | I. 126, 221 | Duty of woman to suckle child | I. 560 |
| — — causing face presentation | I. 222 | Dwarf pelvis | II. 52 |
| Dolores conquiscentes | I. 183 | — — diagram of | II. 52 |
| Dorsal displacement of arm | II. 197 | Dynamics of labour | I. 191 |
| Double uterus, vagina, <i>cf.</i> Uterus, | | Dysmenorrhœa simulated by abor- | |
| Vagina. | | tion | I. 541 |
| Douche, <i>cf.</i> also Irrigations. | | Dyspœnea caused by pharyngitis | I. 541 |
| — cold uterine | I. 237 | — caused by pulmonary thrombosis | I. 542 |
| — hot uterine | II. 238 | — fetal, <i>cf.</i> A-phryna. | |
| — to produce premature labour | II. 196, 198 | Dystocia caused by abdominal swell- | |
| — uterine, in puerperal fever | II. 468 | ing of foetus | I. 165 |
| — vaginal, for inducing pains | II. 495, 496, 497, 503 | — — aneurysm of foetus | I. 17 |
| — — vaginal, for inertia | II. 9 | — — ascites | I. 165 |
| Douglas on labour complicated | | — — callus | I. 165 |
| corpore | II. 186 | — — cancer | I. 165 |
| — pouch of | I. 35 | — — cystic kidneys | I. 165 |
| — semilunar folds of | I. 36 | — — distended bladder | II. 196, 197 |
| D'Outrepont on version | II. 515 | — — distended uterus | I. 166 |
| Drainage after Cæsarian section | II. 621 | — — foetal inclusion | II. 157 |
| — after rupture of uterus | II. 284 | — — hæmatoma | I. 161 |
| — of uterus, permanent | II. 169 | — — hydrothorax | I. 166 |
| Dress, <i>cf.</i> also Clothing. | | — — hypertrophy of cervix | II. 166 |
| — during pregnancy | I. 168 | — — monstrosity | II. 167 |
| Dropsy accompanying myxoma of | | — — new formation | II. 167 |
| chorion | I. 456 | — — — cedema of foetus | II. 167 |
| — <i>cf.</i> also Edema. | | — — ovarian tumour | II. 167 |
| — of amnion, <i>cf.</i> Hydramnios. | | — — pelvic contraction | II. 167 |
| — of foetus, bibliography | II. 202 | — — retained testicle | II. 167 |
| | | — — rigid hymen | II. 167 |

	PAGE
caused by rigid perineum...	II. 142
— tumours ...	II. 143, 179
— uterine polypus ...	II. 148
— vaginal hernia ...	II. 155
also Delivery, obstructed.	
after delivery ...	II. 391
due to impacted uterus...	I. 389
during puerperal state ...	I. 291

E.

in middle ...	II. 361
in middle, bibliography ...	II. 373
development of ...	I. 118
presentation of an ...	I. 219, II. 73, 74
act of respiration ...	II. 361, 373
pregnancy, case of ...	I. 62
crises in asphyxia ...	II. 360
of Hayard ...	II. 360
asphyxia ...	II. 204
etiology of ...	II. 211
albuminuria in ...	II. 211, 212, 216
bibliography ...	II. 215, 225
causing hæmorrhage ...	II. 209
convulsions of, due to pains ...	II. 215
definition of ...	II. 204
diagnosis ...	II. 218
during childbed ...	II. 205
effect on uterus ...	II. 210
frequency of ...	II. 205
hemery during ...	II. 209
hemery during ...	II. 206, 209
pathology of ...	II. 211
premonitory symptoms... ..	II. 206
prognosis of ...	II. 210
progress of ...	II. 206
prophylaxis of ...	II. 219
puerperal... ..	II. 204
sequelæ of ...	II. 209
symptoms of ...	II. 206
terminations of ...	II. 208
treatment of ...	II. 219
treatment of, bibliography ..	II. 222, 225
trine during ...	II. 208, 211, 216
resection in ...	II. 220
typic fit, relation of pains to ...	II. 208
typiform convulsions ...	II. 216
var in extirpation of polypus ...	II. 148
in perforation ...	II. 598
form ...	I. 90
in viscerum ...	I. 482
causing dystocia ...	II. 170
during pregnancy ...	I. 87
of nipple... ..	II. 401, 403
into pleura of fetus ...	II. 169
of blood due to labour ...	II. 546, 547
— cf. also Hematoma.	
bags, cf. also Bags.	
in uterine inversion ...	II. 269
ures in Cæsarian section ..	II. 619, 621
ity of uterine serosa, insuffi-	
cient ...	II. 290

Elbow diagnosed from heel ...	I. 238
Electric shock in treatment of fetal	
sac ...	I. 441
Electricity as oxytocic ...	II. 14
— in galactorrhœa ...	II. 401
— in inducing abortion, biblio-	
graphy ...	II. 504
— in inducing labour ...	II. 495
— in weakness of bladder... ..	II. 395
Electro-puncture of fetal sac ...	I. 441
Elephantiasis congenita cystica ...	II. 163
— post partum ...	II. 386
Elevation of head of fetus—per	
rectum ...	I. 259
Elytrotony, cf. also Laparo-elytro-	
tony.	
— in extra-uterine gestation ...	I. 446
Embolism causing sudden death ...	II. 353
— in puerperal fever ...	II. 445, 446, 447
— of pulmonary artery ...	II. 243, 350, 351, 387
— — — — bibliography ...	II. 355
Embolus, cf. Embolism.	
Embryo, abnormalities of ...	I. 483
— — — bibliography ...	I. 505
— at different months of pregnancy	
... ..	I. 453
— atrophy of ...	I. 453
— cf. also Fœtus.	
— development of ...	I. 90, 115
— diseases of... ..	I. 483, 487, 491
— diseases of, bibliography ...	I. 505
— maceration of ...	II. 449
— nourishment of ...	I. 132
Embryology ...	I. 2
— cf. also Embryo, Fœtus.	
Embryonic area ...	I. 90
Embryothlasia... ..	II. 597
Embryotomy ...	II. 193, 601
— bibliography ...	II. 606
— chloroform in ...	II. 606
— in transverse presentations ...	II. 193
— indications for ...	II. 601
Embryulcia ...	II. 580
Emesis, cf. Vomiting.	
Emetic in asphyxia ...	II. 373
Emphysema, ante-uterine ...	II. 288, 298
— of face, caused by pains ...	II. 19
— — fetus ...	II. 163, 289
— neck ...	II. 19
— thorax ...	II. 19
— — thorax, bibliography ...	II. 19
— — vaginal walls ...	I. 414
— subperitoneal ...	II. 288
Encephalocele, diagnosis from hydro-	
cephalus ...	II. 166
Enchondromata obstructing pelvic	
canal ...	II. 128
Endemic causes of osteo-malacia ...	II. 113
Endocarditis ...	I. 358, II. 447
— bibliography ...	II. 480
— in puerperal fever ...	II. 445, 446, 447
Endochorion ...	I. 100

- PAGE
- Endocolpitis II. 390, 435
 — treatment II. 474
 Endometritis after delivery II. 390
 — catarrhalis II. 435
 — caused by hæmorrhages II. 239
 — caused by pelvic contraction II. 79
 — causing abortion I. 419
 — causing adherent placenta ... II. 250, 252
 — causing cysts I. 410
 — causing death of fetus I. 497
 — cells causing occlusion of os ... II. 135
 — deciduosis catarrhalis I. 411
 — deciduosis chronica I. 409, 474
 — deciduosis polyposa I. 409, 410
 — deciduosis tuberosa I. 409, 410
 — diagnosis II. 454
 — diphtheritic II. 437
 — due to syphilis I. 411
 — during pregnancy I. 409
 — during pregnancy, bibliography ... I. 418
 — hæmorrhagic I. 351, 354
 — necrotic II. 437
 — placentalis gummosa I. 474
 — sloughing II. 377, 381
 Enemata, avoidance of, post partum ... I. 319
 — during labour I. 254
 — nutrient, in uncontrollable vomiting I. 344
 Enlargement of anterior lip of cervix ... II. 148
 Enteric fever during pregnancy ... I. 353, 370
 Euterocoele, vaginal II. 154
 — vaginal, bibliography II. 159
 Eutoceria I. 90
 Entrance of air, *cf.* also Air.
 — of air into ear II. 361, 373
 — of air into uterus II. 344, 351
 — of air into veins II. 350, 351
 Evacuation of fibroids II. 145
 Epiblast I. 90
 Epidemics of puerperal fever II. 430
 Epidemics of macerated fetus I. 499
 Epigastrium, contents of I. 6
 Epilepsy, diagnosis from eclampsia ... II. 218
 — during pregnancy I. 349
 — in regard to suckling I. 321
 — relation of, to eclampsia II. 217
 Epileptogenic zones in eclampsia ... II. 216, 217
 Epi-ovarian pregnancy I. 429
 Epiphyses, injury to, during labour ... II. 548
 — separation of, in fetus I. 484
 Epispasms in eclampsia II. 222
 Epithelial atresia of os II. 135
 Epithelioma, *cf.* Cancer.
 Epithelium of genital canal ... I. 45, 47, 49, 50, 53, 54
 — I. 128
 Epi-uterine sac I. 51
 Epsom salts post partum I. 319
 Equitation *cf.* also Cranial bones.
 Equitation of cranial bones in flat pelvis ... II. 70
 — in generally contracted pelvis II. 71
 Equitation of cranial bones over one another I. 216
 Erectile tissue I. 216
 Erection of cervix I. 252, 523
 Ergot I. 252, 523
 — bibliography II. 523
 — *cf.* also Ergotin.
 — contra-indications to II. 523
 — in abortion I. 523, 525
 — in delayed involution II. 236, 240
 — in hæmorrhage II. 236, 240
 — in induction of premature labour II. 523
 — in uterine inertia II. 523
 — substitutes for, bibliography ... II. 523
 Ergotin I. 523
 — for abortion I. 523
 — for œdema during pregnancy ... II. 523
 — for post-partum hæmorrhage ... II. 523
 — for varicose veins I. 523
 Ergotinum dialysatum I. 523
 Erosion of cervix I. 523
 — cervix and puerperal fever ... II. 523
 — nipple I. 523
 Erotomania I. 523
 Erysipelas in puerperal fever II. 430
 — of breast I. 523
 — para-uterine malignum II. 430
 — relation to puerperal fever ... II. 430
 Erythema in puerperal fever II. 430
 Esnard's bandages in treatment of hæmorrhage I. 523
 Estimation of age of fetus I. 523
 — of period of pregnancy I. 523
 — of time of delivery I. 523
 Ether in treatment of anaemia I. 523
 Ethylene chloride in Cæsarian section I. 523
 Eucalyptus globulus as antipyretic ... I. 523
 European pelvis I. 523
 Eustachian tube, air in I. 523
 — tube, air in, bibliography I. 523
 — valve I. 523
 Evacuation, rapid, of uterus, causing atony II. 523
 Eventration I. 384, 482
 Eversion of lips of os I. 523
 Evisceration II. 523
 — in transverse presentation ... II. 523
 Evolution corpus duplicata II. 523
 — corpus duplicata, diagram II. 523
 — spontaneous II. 523
 — bibliography II. 523
 — diagram of II. 523
 — in contracted pelvis II. 523
 Examination, bimanual I. 523
 — candidates and puerperal fever ... II. 523
 — digital I. 523
 — external I. 523
 — internal I. 523

	PAGE		PAGE
Emaciation, obstetrical ...	1. 140, 149	External rotation of head ...	1. 201, 211, 212, 213, 219
— of abdomen ...	1. 141	— — of head in face presentations ...	1. 225
— of breasts ...	1. 141	Extirpation of ovaries ...	11. 622
— of pelvis ...	1. 151, 11. 29, 37	— — polypus ...	11. 148
— per hypogastrium ...	1. 151	— — tumours during labour ...	11. 145
— per rectum ...	1. 151	— — uterus ...	11. 621
— per vagina ...	1. 149, 252	— — uterus, bibliography ...	11. 624
— recto-abdominal ...	1. 152	Extraction after perforation ...	11. 590
— vaginal ...	1. 119, 252	— artificial, when justifiable ...	11. 9
— vaginal, objects of ...	1. 150	— by the breech ...	11. 528, 541, 542
Exanthemata and puerperal fever ...	11. 427	— by the feet ...	11. 529
Exanthemata during pregnancy ...	1. 352	— corpus conduplicate ...	11. 605
— bibliography ...	1. 370	— dangers of podalic ...	11. 530, 544
Exenteration ...	11. 601	— forceps ...	11. 571
— cf. also Evisceration.		— modes of, bibliography ...	11. 552
Exercise in open air during pregnancy ...	1. 168	— of arm ...	11. 534, 535
Exacerbation ...	11. 579, 583	— — child, injuries accompanying ...	11. 546
— cf. also Perforation.		— — head ...	11. 537
Excitation of uterus ...	11. 495, 496	— — perforated fetus ...	11. 579
Excitement at onset of lactation ...	1. 301	— — — bibliography ...	11. 600
Exhaustion due to delivery ...	11. 79, 349	— — placenta ...	1. 264, 11. 253
— of abdominal muscles ...	11. 66	— — trunk ...	11. 532
— of uterus ...	11. 3, 231	— — podalic ...	11. 529
Exochorion ...	1. 99	— Prague method of ...	11. 537, 538, 547, 552
Exostoses causing pelvic deformity ...	11. 128	— with cephalothrypter ...	11. 592, 596
— cf. also Dystocia.		— with cranioclast ...	11. 592, 594
— pelvic, bibliography ...	11. 133	Extra-median presentation ...	11. 73, 74, 86
Expansion, area of ...	1. 71, 192, 334, 340	Extra-peritoneal pregnancy ...	1. 424
Exploitation, obstetrical, cf. Examination.		Extra-uterine abdominal pregnancy ...	1. 430
Expression in uterine inertia ...	11. 9, 14	— fetus, death of ...	1. 423, 425, 428, 433, 442
— of fetus, bibliography ...	11. 25	— migration ...	1. 420
— of fetus, modus operandi ...	11. 15	— placenta ...	1. 421
— of membranes after abortion ...	1. 525	— pregnancy ...	1. 372, 418, 423
— of placenta ...	1. 264, 265	— — abdominal ...	11. 419, 421, 430
Expulsion corpus conduplicate ...	11. 186, 189	— — bibliography ...	11. 501
— — bibliography ...	11. 189	— — caesars ...	1. 449
— — diagram ...	11. 189	— — co-existing with intra-uterine ...	1. 136
— — treatment ...	11. 190	— — diagnosis of ...	1. 436
— duration of period of ...	1. 187	— — effect on uterus ...	1. 438, 439, 437
— of extra-uterine fetus ...	1. 433	— — epi-ovarian ...	1. 429
— of fetus ...	1. 171, 182, 258	— — extra-peritoneal ...	1. 421
— of placenta ...	1. 178, 181, 264	— — figures ...	1. 422, 424, 426, 427
— of placenta with twins ...	1. 279	— — fetal sac in ...	1. 427, 428, 430
— period ...	1. 182	— — in hernial sac ...	1. 431
— period, inertia during ...	11. 7	— — ovarian ...	1. 429
— period, management of ...	1. 257	— — peritoneal ...	1. 430
Expulsive forces ...	1. 171, 175, 177	— — prognosis ...	1. 440
— forces, anomalies of ...	11. 3, 8	— — treatment ...	1. 410
— forces, weakness of ...	11. 1, 5	— — tubal ...	1. 419, 422
Extension of body of fetus ...	1. 200	— — tubal, rupture of ...	1. 423
— of head ...	1. 260, 211, 212	— — tubal, varieties of ...	1. 427
— — in breech presentation ...	1. 243, 247	— — twins in ...	1. 435
— — in occipito-posterior positions ...	1. 217	— — souldle ...	1. 444
— — per rectum ...	1. 259	Eye affections during pregnancy ...	1. 410
— — persistent ...	1. 227	— — in puerperal toxic ...	11. 448, 461
External conjugate ...	1. 15	— — — bibliography ...	1. 450
— cf. also Conjugate.		Eyes, development of ...	1. 117, 118
— oblique diameters ...	11. 36		
— rotation in breech presentation ...	1. 240		

	PAGE		PAGE
F.		Femur, fracture of, causing oblique de-	
Face, changes in, during pregnancy ...	1. 87	formity ...	11. 18
— emphysema of, during labour ...	11. 19	— injury to, during labour ...	11. 19
— emphysema of, bibliography ...	11. 19	— ossification of ...	1. 121, 122
— presentations ...	1. 220	Fenestrated curette ...	1. 158
— — actiology ...	1. 220, 222, 190	— placenta ...	1. 161
— — bibliography ...	1. 250	Fenizio, scrotocephalotomy of ...	11. 538
— — caput succedaneum in ...	1. 226	Fergusson's speculum during perfora-	
— — conversion of, into vertex ...	1. 229	tion ...	11. 539
— — danger to perineum ...	1. 260	Ferments, digestive, in new-born child ...	1. 231
— — diagnosis of ...	1. 223	Ferri perchloric liquor ...	1. 449, 11. 238, 240
— — due to distended bladder ...	1. 222		296, 300, 301
— — due to hydrothorax ...	1. 221	Fever, effect on fetal pulse ...	1. 145
— — due to uterine tumour ...	1. 222	— enteric, <i>cf.</i> Typhoid fever ...	1. 396
— — duration of labour in ...	1. 228	— malarial, during pregnancy ...	1. 396
— — during pregnancy ...	1. 221	— puerperal, <i>cf.</i> Puerperal ...	11. 429
— — extension of head after ...	1. 227	— relapsing, <i>cf.</i> Relapsing ...	
— — figures of ...	1. 225, 226, 227	— scarlet, <i>cf.</i> Scarlet ...	
— — forceps with ...	11. 575	— scarlet, in childbed, tabular ...	
— — frequency of ...	1. 205, 223	graphy ...	11. 181
— — goitre accompanying ...	1. 221, 190	— — relation to puerperal fever ...	11. 418
— — in contracted pelvis ...	11. 60, 75, 86		147
— — management of ...	1. 228	— treatment of high ...	11. 471
— — mechanism ...	1. 224	— typhoid, <i>cf.</i> Typhoid ...	
— — moulding of head in ...	1. 227	— typhus, <i>cf.</i> Typhus ...	
— — prognosis of ...	1. 228	Fibrinous polypus ...	11. 389
— — sero-sanguinous swelling with ...	1. 226	— — after abortion ...	1. 315, 316
Facial nerve, paralysis of ...	1. 227, 11. 565, 566	— — bibliography ...	1. 31
Faeces, accumulation of, causing inertia ...	11. 5	Fibroid causing inversion of uterus ...	1. 360
— incontinence of, after perineal		— changes in, after delivery ...	1. 399
rupture ...	11. 310	— changes in, during pregnancy ...	1. 399
— of new-born child ...	1. 311, 328, 331	— complicating pregnancy ...	1. 399
Fallopian tube ...	1. 33, 36, 52, 78, 122	— expulsion of, resembling abortion ...	1. 399
— — ampulla of ...	1. 33, 51	— extirpation of ...	1. 391
— — fimbriae of ...	1. 33	— necessitating abortion ...	1. 392
— — pregnant, <i>cf.</i> Extra-uterine		— rupture passing through ...	1. 393
pregnancy ...	1. 418, 422	— uterine ...	1. 393, 11. 141
— — tubes, accessory orifices of ...	1. 120	— uterine, bibliography ...	1. 417, 11. 150
— — division of ...	11. 622	— uterine, <i>cf.</i> also Myoma ...	
— — in puerperal fever ...	11. 195	— uterine, figure ...	11. 146
— — involution of ...	1. 296	— uterine, obstructing labour ...	11. 143, 151
False conception ...	1. 449	— vaginal ...	11. 143
— corpus luteum ...	1. 63	Fibroma obstructing pelvic canal ...	11. 12
Faradism, <i>cf.</i> Electricity ...		— of placenta ...	1. 472
Fascia of pelvis ...	1. 26	Fibrous hypertrophy of cervix ...	11. 13
— of perineum ...	1. 26	— myxoma of the placenta ...	1. 471
Fat, deposit of, during pregnancy ...	1. 81	Fillet ...	11. 518, 527, 531, 544, 545
— — fatness, face presentations with ...	1. 222	— <i>cf.</i> also Noose ...	
— — increase of, during pregnancy ...	1. 78, 81	— dangers of ...	11. 511, 541
— — proportion of, in milk ...	1. 304	— in breech extraction ...	11. 542, 543, 544
Father, syphilis in ...	1. 364	— in extraction of head ...	11. 541
Fatty degeneration of foetus ...	1. 499	Fimbria ovarica ...	1. 23, 6
— degeneration of placenta ...	1. 472	Fimbriae of Fallopian tube ...	1. 3
— degeneration of uterine walls ...	11. 5	Finger in extraction of breech ...	11. 542, 543
Fecundation, <i>cf.</i> Fecundation ...		— in extraction of head ...	11. 543
Feeding, artificial, of infants ...	1. 328	Fissure of cranial bones caused by	
— — various modes of ...	1. 328	pelvic contraction ...	11. 6
Female pelvis compared to male ...	1. 22	— of apple ...	11. 191, 192
Femoral uterine hernia ...	1. 382	— Sylvian, in foetus ...	1. 13
Femur dislocated, causing pelvic de-		Fissured pelvis ...	11. 12
formity ...	11. 98, 124	— — bibliography ...	11. 12
— — — — figure ...	11. 125	— — dilatability of ...	11. 12

	PAGE
Fissured symphysis	11. 159
Fistula, caused by forceps	11. 72, 366, 367
— cervical	11. 303
— lateral	11. 307, 411
— rectal	11. 301
— vaginal	11. 301, 303
— vaginal, bibliography	11. 327
— vesical	11. 72, 292, 301
Fit, eclampsia	11. 204, 206
Flaccid joints	1. 534
Flaccidity of uterus in inversion	11. 260, 261
Flagellation of nates	11. 367
Flat generally contracted pelvis	11. 27, 71, 76
— — — — — <i>cf.</i> Generally contracted.	
— pelvis	11. 27, 41
— etiology	11. 45, 126, 131
— — <i>cf.</i> also Pelvis, flat.	
— — description	11. 41
— — diagnosis of	11. 46
— — diagrams	11. 12, 44
— — due to dislocation of femur	11. 126
— — due to fissured symphysis	11. 131
— — measurements of	11. 44, 46
— — mechanism of delivery with	11. 68
— — mode of origin	11. 45, 126, 131
— — pelvic presentation in	11. 75
— — varieties of	11. 44
— — rickety pelvis	11. 46
— — diagnosis	11. 49
— — diagram of	11. 43, 48
— — — — — physique accompanying	11. 49
Flattening of one of twins	1. 274
Flatus in continence of	11. 310
Flexion of foetal head during labour	1. 199, 210
— — — — — during pregnancy	1. 127
— — — — — insufficient	1. 220, 490
— — of urethra after delivery	11. 394
— — of uterus causing lochiometra	11. 377
Floor of pelvis	1. 25
— of pelvis, effect on head	1. 198, 200
Flow of milk	1. 57
Fluid, amnio-chorionic	1. 101, 182, 277, 412, 460, 11. 185
— amniotic, <i>cf.</i> Liquor amnii	
Fecundation of ovum	1. 63
Foetal, <i>cf.</i> Fetus.	
Foetal membranes, <i>cf.</i> Membranes.	
— sac, <i>cf.</i> Sac.	
Festation, extra-uterine, <i>cf.</i> Extra-uterine pregnancy.	
Feto-amniotic bands	1. 459
Fetus	1. 95, 115
— abnormal attitude	11. 59, 178, 193
— abnormal rotations	11. 193
— adhesion of amnion to	1. 459
— adhesion of, to placenta	11. 177
— adhesion of, to uterus	11. 177
— anasarca of	11. 163, 203
— ascites of	11. 169
— asphyxia of	1. 133, 216, 11. 227, 356
— — — — — <i>cf.</i> also Asphyxia.	

Fetus, asphyxia of, in pelvic contraction	11. 75, 80
— — — — — in pelvic presentations	1. 248
— — — — — treatment	11. 367
— aspiration of blood by	1. 262
— at different months of pregnancy	1. 115
— attitude of, in utero	1. 127, 235
— bathment of	1. 142
— bibliography	1. 138
— cadaveric rigidity of	11. 164
— changes in dead	1. 499
— characters of mature	1. 121
— circulation in	1. 135
— circulation in, diagram	1. 131
— circumscribed enlargement of	11. 165
— coiling of cord round	1. 477, 11. 201
— — — — — <i>cf.</i> also Coiling.	
— compress	1. 275
— consumption of oxygen by	1. 134
— crepitation of	11. 164
— cry of, before delivery	11. 362
— culbute of	1. 131
— death of	1. 496
— death of, due to syphilis	1. 491
— — — — — effect on uncontrollable vomiting	1. 342
— — — — — from infectious disease	1. 351
— decapitation of	11. 602
— decapitation of, bibliography	11. 604
— decomposition of	1. 362, 363, 11. 163, 288, 289
— — — — — and puerperal fever	11. 491
— — — — — causing physometra	11. 288, 347
— delivery of trunk of	1. 201
— development of	1. 116, 117, 120
— diagnosis of dead	1. 161
— diagnosis of living	1. 164
— diameters of head of	1. 179
— diseases of	1. 487, 490, 494
— — — — — bibliography	1. 501
— drops of, <i>cf.</i> also Fetus, amniotic	
— — — — — saccus of	11. 163, 201
— dyspnoea of	1. 134
— dyspnoea of, <i>cf.</i> also Asphyxia.	
— earliest movements of	1. 118
— effect of chloroform on	1. 268
— effect of pain on	1. 190
— effect of syphilis on	1. 165, 361
— emphysema of	11. 163, 289
— estimation of age	1. 115, 120
— evisceration of	11. 601, 604
— excessive size of	11. 160, 168
— — — — — bibliography	11. 203
— exenteration of	11. 601
— expression of	11. 15, 25
— — — — — bibliography	11. 25
— — — — — in inertia	11. 9, 14
— expulsion of	1. 171, 182
— — — — — <i>cf.</i> also Expulsion.	
— extra-uterine, <i>cf.</i> Extra-uterine	
— extraction of, <i>cf.</i> Extraction	

- | | PAGE | | PAGE |
|--|------------------|---|-------------------------------|
| Fetus, figures of, at various ages | I. 116, 117 | Fetus, size of, in different months | I. 145, 149 |
| — fontanelles of, <i>cf.</i> Fontanelle. | | — skull of, figures ... | I. 124 |
| — giant ... | I. 122, II. 160 | — — — shape ... | I. 123, 125 |
| — habitual death of, <i>cf.</i> Habitual. | | — small-pox in ... | I. 133 |
| — head of ... | I. 123 | — sounds of heart ... | I. 143, 146, 154 |
| — head of, <i>cf.</i> also Head. | | — — — <i>cf.</i> also Heart-sounds. | |
| — heart-beat of ... | I. 143, 146, 154 | — suffocation of ... | I. 154 |
| — heart-beat of, <i>cf.</i> also Heart. | | — super-rotations of ... | I. 219, 244 |
| — hydrocephalic ... | II. 165 | — sutures of, <i>cf.</i> Sutures | |
| — hydrathorax of ... | II. 169 | — syphilitic in ... | I. 491, II. 197 |
| — inclusion of ... | II. 170 | — temperature of ... | II. 39 |
| — lanugo of, <i>cf.</i> Lanugo | | — tetanic constriction of ... | II. 39 |
| — length of ... | I. 115, 121, 122 | — tumours of ... | II. 170 |
| — lie of, in utero ... | I. 127, 128 | — tumours of, bibliography | II. 203 |
| — maceration of ... | I. 499 | — usual presentation of, in mam- | |
| — malformations of ... | I. 483, II. 172 | — — — malia ... | I. 435 |
| — malformations of, bibliography | II. 203 | — variola in ... | I. 503 |
| — mature, head of ... | I. 123, 125 | — version of, <i>cf.</i> Version. | |
| — meconium of, <i>cf.</i> Meconium. | | — want of oxygen ... | I. 134, II. 39 |
| — membranes of, <i>cf.</i> Membranes. | | — weight of ... | I. 115, 121, 122 |
| — membranes of, in twin pregnancy | I. 271 | Fetuses, multiple, causing inertia | II. 3 |
| — metabolism in ... | I. 133 | Folds of Douglas ... | I. 36 |
| — mortality of, in contracted pelvis | II. 80 | Follicles, bursting of ... | I. 60 |
| — movements of I. 118, 130, 143, 153, 151 | | — Graafian ... | I. 54 |
| — — — during labour ... | I. 181, 182 | — stigma of ... | I. 60 |
| — — — when first felt ... | I. 159 | Fomentations in stricture of os | II. 25 |
| — — — mummification of ... | I. 500 | — in stricture of uterus ... | II. 28 |
| — — — causes ... | I. 501 | — in uterine inertia ... | II. 3 |
| — muscular development of ... | I. 137 | Fontanelle, abnormal ... | I. 125 |
| — mutilation of ... | II. 601 | — anterior ... | I. 124, 241, 246 |
| — nutrition of ... | I. 132 | — cerebellar ... | I. 127 |
| — obliquity of head ... | I. 198 | — lateral ... | I. 124 |
| — — — <i>cf.</i> Obliquity. | | — in hydrocephalic skull | II. 165 |
| — osiens of ... | II. 163 | — naso-frontal ... | I. 125 |
| — ossification of ... | I. 117, 120 | — occipital ... | I. 125 |
| — papyraceous ... | I. 275 | — perforation at a lateral ... | II. 579 |
| — papyraceous, bibliography | I. 286 | — position of, in flat pelvis | II. 68 |
| — pathology of ... | I. 483, II. 172 | — — — in generally contracted | |
| — — — bibliography | I. 505, II. 203 | — pelvis ... | II. 79 |
| — perforation of ... | II. 579 | — posterior ... | I. 124, 241 |
| — — — <i>cf.</i> also Perforation. | | — sagittal ... | I. 125 |
| — pleural effusion in ... | II. 169 | — small ... | I. 124, 241 |
| — position of, during delivery | I. 205 | Fontanelles, value of, in diagnosing | |
| — position of, in utero ... | I. 127, 131 | — size of head ... | II. 85 |
| — presentations of, <i>cf.</i> Presentations | | Fonticuli Casserii ... | I. 124 |
| — pulse of ... | I. 143, 146 | Food for new-born babe ... | I. 328, 329 |
| — pulse of, <i>cf.</i> also Heart sounds. | | Foot diagnosed from hand ... | I. 247 |
| — pulse of, slowed by pains ... | I. 203 | — prolapse of ... | II. 191 |
| — putrefaction of I. 502, 503, II. 163, 288 | | — prolapse of, treatment ... | II. 196 |
| — — — causing physometra ... | II. 347 | — selection of, in version ... | II. 519, 525 |
| — relapsing fever in ... | I. 351 | Footling presentation, advantage over | |
| — respiration of ... | I. 133 | — breech ... | II. 546 |
| — rotations of ... | I. 198, 199 | Footling presentations ... | I. 261, 264 |
| — rotations of, <i>cf.</i> Rotations. | | — — — accompanying pelvic ex- | |
| — sac of, <i>cf.</i> Sac. | | — — — traction ... | II. 6 |
| — separation from mother ... | I. 262 | Foramen ovale ... | I. 113 |
| — septic infection of ... | II. 476, 478 | — — — closure at birth ... | I. 300 |
| — sex influencing duration of | | — — — valve of ... | I. 135, 307 |
| — labour ... | I. 187 | Force, bearing down, <i>cf.</i> Abdominal | |
| — shrivelling up of ... | I. 499, 500 | — pressure | |
| | | Forced delivery ... | I. 533, 544, II. 224, 62 |
| | | Forceps ... | I. 352, II. 353, 537, 545, 55 |

	PAGE		PAGE
Forceps, application of ...	11. 567, 573, 576	Forceps, slipping of the ...	11. 577
— axis traction ...	11. 556	— Smellie's ...	11. 554, 555
— axis traction, bibliography ...	11. 579	— Tarnier's ...	11. 556, 563
— Bernard's ...	11. 555	— Tarnier's, bibliography ...	11. 579
— best form of lock ...	11. 558	— traction with ...	11. 571, 572
— best size of ...	11. 557	— Trefurt's ...	11. 555
— bibliography ...	11. 578, 579	— width of blade ...	11. 557
— blades, relation to head ...	11. 568	— with after-coming head ...	11. 537, 540, 576
— blades, slipping of ...	11. 570	— — brow presentation ...	11. 576
— breech ...	11. 542, 545	— — face presentation ...	11. 575
— causing facial paralysis ...	11. 565, 566	— — occipito-posterior presenta- tion ...	11. 573
— causing fistula ...	11. 562	— — posterior parietal presenta- tion ...	11. 575
— causing rupture of pelvic joint's ...	11. 524	Forces, expulsive ...	1. 171, 175, 177, 11. 5, 16
— Chamberlen's ...	11. 553	— — <i>cf.</i> also Expulsive.	
— Chassagny's ...	11. 555	— — derived from abdominal muscles ...	1. 177, 11. 6, 7
— counter-indications to use of ...	11. 562, 563	— — derived from round ligaments ...	1. 178
— craniotomy ...	11. 591	— — derived from uterus ...	1. 175
— curves of ...	11. 557, 558	— — derived from vagina ...	1. 178
— cutting, Ritgen's ...	11. 598	Forceps perforators, Lollin's ...	11. 598
— dangers accompanying ...	11. 559, 565, 566, 570	Fore-vertex presentation ...	1. 217, 11. 68, 72
— description of ...	11. 553, 557	— presentation, diagram ...	11. 69
— dynamical action of ...	11. 561	Fore-waters, absence of ...	11. 201
— frequency of application ...	11. 562, 564	— action of ...	1. 196
— Harmon's ...	11. 555	— condition of, in pelvic con- traction ...	11. 62
— history of ...	11. 553	— definition of ...	1. 180
— history of, bibliography ...	11. 578	— in transverse presentations ...	11. 185
— how unlocked ...	11. 572	— low pressure in ...	11. 11
— in contracted pelvis ...	11. 84, 85, 564	Fork-shaped umbilical cord ...	1. 273
— in extracting after-coming head ...	11. 537, 540	Form-restitution force of uterus ...	1. 130, 190
— in extraction of breech ...	11. 542, 545	— restitution of ...	11. 4
— in pelvic contraction ...	11. 81, 85, 564	Fornix vaginæ ...	1. 31
— in protracted labour ...	11. 564	Fossa navicularis, injuries to ...	11. 304
— indications for ...	11. 564	— Sylvian, in fetus ...	1. 121
— injuries accompanying use of ...	11. 566	Fourchette, <i>cf.</i> also Frenulum ...	1. 46
— Joulin's ...	11. 555	— rupture of ...	11. 307
— justifiability of early use of ...	11. 9, 564	Fracture caused by forceps ...	11. 566
— lever action of ...	11. 560	— greenstick, in fetus ...	1. 488
— Levet's ...	11. 554, 565	— intra-uterine ...	1. 483
— locking of ...	11. 570	— of femur causing oblique pelvic deformity ...	11. 98
— Matter's ...	11. 556	— of hum of fetus ...	1. 484
— mode of application ...	11. 567	— of occipital bones caused by pelvic contraction ...	11. 76, 77, 547
— operations, bibliography ...	11. 578	— of parietal bones caused by pelvic contraction ...	11. 76, 77
— — chloroform in ...	11. 567	— of pelvis causing deformity ...	11. 129
— — conditions for ...	11. 562, 563	— of skull of fetus ...	1. 484, 11. 76, 547
— — description of ...	11. 567	— of sternum during pains ...	11. 19
— — difficult ...	11. 566, 573	— produced during labour ...	1. 484, 11. 76, 77, 548, 566
— — duty of assistants ...	11. 567, 570	Frenulum ...	1. 46, 163
— — frequency of ...	11. 562, 564	— absence of, after delivery ...	1. 163
— — high ...	11. 563, 564, 573	— causing obstruction to labour ...	11. 142
— — low ...	11. 563, 565, 574	— condition of, after delivery ...	1. 297
— — object of ...	11. 559	— laceration of ...	1. 260
— — prognosis of ...	11. 565	— rupture of ...	11. 307
— oscillatory movements of ...	11. 560, 561, 571	— undue thickness of ...	11. 142
— osium ...	1. 526	— fragility of the membranes ...	11. 198
— Palfyn's ...	11. 554		
— removal of, from head ...	11. 572		
— rotatory movements of ...	11. 560, 571		
— saw, van Huevel's ...			

- French method of extraction ... 11. 88
 Frequency of pelvic contraction ... 11. 29
 Frerichs on acute atrophy of liver ... 1. 357
 — on eclampsia ... 11. 211
 — on fetus neonatorum ... 1. 313
 Friction of uterus for induction of labour ... 11. 495
 — of uterus in inertia ... 11. 9
 Fritsch on heart disease during pregnancy ... 1. 361
 Funicular suture ... 1. 124
 Fundus of uterus ... 1. 32
 — — — height of, during pregnancy ... 1. 159
 — uteri, inversion of ... 11. 200
 — — — — *cf.* also Inversion.
 — vagina, injury to ... 11. 296, 567
 — vagina, edema of ... 11. 303
 Fungi, *cf.* also Bacteria, Micro-organisms.
 — in leucorrhœa ... 1. 413
 Funic souffle ... 1. 143, 146
 — souffle, *cf.* also Souffle.
 Funiculus umbilicalis, *cf.* Umbilical cord.
 Funds, *cf.* Umbilical cord.
 Funnel-shaped injuries, due to rubbing ... 11. 292
 — inverted pelvis ... 11. 93
 — pelvis ... 1. 248, 11. 26, 91
 — pelvis, *cf.* also Infundibuliform pelvis.
- G.
- Gart, proud, during pregnancy ... 1. 83
 Galactagogue ... 1. 323
 Galactocele ... 11. 411
 — diagnosis ... 11. 412
 Galactorrhœa ... 1. 320, 11. 399
 Galvanic cauterium in extra-uterine pregnancy ... 1. 441, 446
 Galvanism, *cf.* also Electricity.
 Ganglia of uterus ... 1. 68, 174
 Ganglion, great cervical ... 1. 173
 Gangrene and puerperal fever ... 11. 427
 — caused by cooling of cord ... 1. 477
 — caused by ice-bag ... 11. 241
 — of fibroids ... 1. 400
 — of inverted uterus ... 11. 264
 — of mucosa of bladder ... 1. 390
 Gartner's during pregnancy ... 1. 168
 Gases, presence of putrefactive, in uterus ... 11. 348
 Gassner, effect of pregnancy on dead ... 1. 83
 Gastric glands in new-born child ... 1. 311
 Gastro-hysterotomy ... 11. 607
 — — — *cf.* also Cesarean section.
 Gastrotomy, *cf.* also Cesarean section, Laparotomy.
 — in extra-uterine pregnancy ... 1. 443
 — in puerperal fever ... 11. 475
 — in rupture of fetal sac ... 1. 139
 — in rupture of uterus ... 1. 416
- Gastrotomy, primary, in extra-uterine pregnancy ... 1. 443, 444
 — secondary in extra-uterine pregnancy ... 1. 441
 Gelatine of Wharton, *cf.* Jelly.
 Generally contracted flat pelvis ... 11. 27, 28
 — — — diagnosis ... 11. 27
 — — — figures ... 11. 27, 27
 — — — mechanism of delivery ... 11. 27
 — — — varieties ... 11. 27
 Generally contracted pelvis ... 11. 27, 27
 — — — bibliography ... 11. 27
 — — — causes ... 11. 27
 — — — characters of ... 11. 27
 — — — diagnosis ... 11. 27
 — — — measurements ... 11. 27
 — — — mechanism of delivery ... 11. 27
 Generation, *cf.* Generative, Genital.
 Generative organs ... 1. 29
 — — — bibliography ... 1. 29
 — — — changes in during pregnancy ... 1. 29
 — — — *cf.* also Genital canal.
 — — — development of at puberty ... 1. 62
 — — — development of in fetus ... 1. 118
 — — — during menstruation ... 1. 60
 — — — hemorrhage from ... 1. 265
 — — — — *cf.* also Hemorrhage.
 — — — literature ... 1. 27
 — — — malformations of ... 1. 351
 — — — minute structure of ... 1. 65
 — — — edema of ... 1. 81, 340
 — — — edema of, *cf.* also Edema.
 — — — varices of ... 1. 81
 Genital canal, atresia of ... 11. 144, 148, 149
 — — — distention of ... 1. 252, 11. 443
 — — — dryness of ... 11. 41
 — — — inflammation of, during labour ... 11. 2
 — — — rupture of, *cf.* Rupture.
 Genital organs, *cf.* Generative organs.
 Genu-pectoral posture causing phlebotomy ... 11. 46
 — — — in passing catheter ... 11. 156, 157
 — — — in replacing hernia ... 11. 157
 — — — in replacing prolapsed cord ... 11. 46
 — — — in retroversion of gravid uterus ... 1. 295, 296
 Geographical conditions affecting pelvic contraction ... 11. 29
 German's, St., tea ... 1. 519
 Germinal disk ... 1. 34
 — epithelium ... 1. 412
 — spot ... 1. 34
 — vesicle ... 1. 51
 Germs, *cf.* also Bacteria, Micro-organisms.
 Germs, infective ... 11. 425
 — putrefactive, causing disease ... 11. 425
 Gestandi impotentia ... 1. 25

	PAGE		PAGE
tion, <i>cf.</i> Pregnancy.		H.	
foetuses ...	1, 122, 11, 160	Habitual abortion ...	1, 365
pelvic ...	11, 325, 326	— abortion due to retroversion ...	1, 388
Thyroid, <i>cf.</i> Thyroid, Goitre.		— death of foetus ...	1, 497
as varicellares ...	1, 57	— — — and premature labour ...	11, 492
Bartholini's ...	1, 46	— — — treatment ...	1, 498
cervical ...	1, 50	Habitus eretoid ...	11, 53
lower's ...	1, 30	— rickety ...	11, 49
ocidial ...	1, 96, 97, 98	Hæmatocele ...	1, 423, 425, 442
Swaney's, <i>cf.</i> Glands, Bar-		— <i>cf.</i> also Hæmatoma.	
tholin's ...	1, 46	— of cervix ...	11, 320
obial ...	1, 45	Hæmatoma, ante-uterine ...	11, 293
summary, <i>cf.</i> Mammary	1, 55	— due to tubal pregnancy ...	1, 425
Montgomery's ...	1, 57, 80	— during pregnancy ...	11, 316
Leiderer's ...	1, 57, 80	— of cervix ...	11, 320, 382
abacous, of labia ...	1, 45	— — clitoris ...	11, 314
terine, structure ...	1, 49	— — pelvis ...	1, 425
— importance for new mucosa ...	1, 294	— — placenta ...	1, 468
clitoridis ...	1, 46	— — sterno-mastoid ...	11, 546
sches for irrigation ...	11, 467	— — vagina ...	11, 298, 315
as, milk ...	1, 303	— — vagina, bibliography ...	11, 315, 327
l region, striae of ...	1, 82	— — vagina, polypoid ...	11, 324
uria, <i>cf.</i> Diabetes.		— — vagina, treatment ...	11, 319
milk of, for infant ...	1, 328	— — vulva ...	11, 314
causing abnormal presenta-		— produced during extraction ...	11, 546
tion ...	1, 490	— subperitoneal ...	11, 298
causing brow presentations ...	1, 490	— vaginal ...	11, 298, 315
causing face presentation ...	1, 221, 490	Hæmatometra ...	1, 156, 374
causing utal, bibliography ...	1, 505	Hæmaturia during eclampsia ...	11, 208
counters-indicating chloroform ...	1, 268	Hæmophilia ...	1, 339, 11, 292
ce to face presentation ...	1, 227	Hæmorrhage, accidental ...	1, 538
ce to pregnancy ...	1, 85	— accompanying molar pregnancy ...	1, 458
etel ...	1, 490, 11, 364	— accompanying myomata ...	11, 144
tra-uterine ...	1, 190, 11, 364	— after birth of child ...	11, 227
emporary, in foetus ...	1, 490	Hæmorrhage after rupture of uterus	
water's skin for sore nipple ...	11, 493	1, 416, 11, 283, 284, 287, 289, 295	
d lotion for intertango ...	1, 326	— after rupture of vagina ...	11, 298, 300
for sore nipples ...	1, 324	— after 28th week of pregnancy ...	1, 528
in cystitis ...	11, 393	— before delivery ...	1, 595, 528, 534
in follicles ...	1, 54	— cervical ...	11, 382
bursting of ...	1, 60	— checked by thrombosis ...	11, 228
uterus, <i>cf.</i> Pregnancy, Uterus.		— death from ...	1, 341, 517, 11, 234
retroversion of, <i>cf.</i> Retro-		— due to abortion ...	1, 511, 513, 522, 523
version.		— — detachment of placenta ...	1, 529
ation, effect on lie ...	1, 130	— — — eclampsia ...	11, 209
fect on position ...	1, 132	— — — hæmatoma ...	11, 349
y, centre of, during pregnancy ...	1, 82	— — — hæmophila ...	11, 292
ecidic, of uterus ...	1, 80	— — — hydrainnia ...	1, 464
pelvis, <i>cf.</i> Pelvis ...	1, 8, 11, 32	— — — inversion of uterus ...	11, 263
tick fracture in rickets ...	1, 488	— — — placenta prævia ...	1, 539, 544
separating body of uterus		— — — polypus of uterus ...	11, 148
from lower segment ...	11, 64	— — — purpura ...	11, 232
n, <i>cf.</i> also Development.		— — — retroflexion of uterus ...	11, 379
of fetus ...	1, 115, 119, 120	— — — syphilis ...	1, 496
of pelvis ...	1, 19	— during expulsion of placenta ...	1, 185
uterus during pregnancy ...	1, 68	— during labour ...	1, 180
— in extra-uterine pregnancy ...	1, 68	— during pregnancy ...	1, 507
lien, effect of pregnancy on		— fatal, from varicose veins ...	1, 341
blood ...	1, 83	— fatal, in abortion ...	1, 517
eping, softening of joints in ...	1, 115	— from bulbs of vestibule ...	11, 305
ata, syphilitic ...	1, 47	— — navel ...	11, 330
ot wound of uterus ...		— — placental site ...	11, 227

- | | PAGE | | PAGE |
|--|--------------------------------|--|------------------|
| Hæmorrhage from ruptured cord ... | 11. 330 | Head, foetal, development of ... | 1. 117 |
| — — umbilical vessels ... | 11. 226 | — — diagnosis from breech ... | 1. 297 |
| — — vulva ... | 11. 304 | — — displacement of bones of ... | 1. 274 |
| — in abdominal pregnancy, <i>cf.</i> | | — — dehiscent cephalic ... | 1. 126, 221, 222 |
| Extra-uterine pregnancy. | | — — extension of ... | 1. 299, 311 |
| — internal, treatment by indin- | | — — — — <i>cf.</i> also Extension. | |
| rubber bags ... | 1. 538 | — — — — in breech presentations | 1. 245, 247 |
| — internal uterine, symptoms ... | 1. 530, 531 | — — extrication of, after version ... | 1. 237 |
| — into decidua ... | 1. 448 | — — flexion of, during labour ... | 1. 199, 210 |
| — into decidua, bibliography ... | 1. 504 | — — flexion of, during pregnancy ... | 1. 137 |
| — into placenta ... | 1. 468 | — — flexion of, insufficient ... | 1. 220, 400 |
| — intra-uterine, causing collapse ... | 11. 233 | — — fontanelles of ... | 1. 129 |
| — intra-uterine, physical signs of ... | 11. 233 | — — — — <i>cf.</i> also Fontanelles. | |
| — physiological ... | 1. 538 | — — insufficient flexion of ... | 1. 220, 400 |
| — placental ... | 11. 228 | — — measurements of ... | 1. 132 |
| — post-partum ... | 11. 228 | — — mobility of, on spine ... | 1. 136 |
| — post-partum, in placenta prævia ... | 1. 541 | — — mouldability of ... | 1. 137 |
| — reaction after ... | 11. 241 | — — moulding of ... | 1. 232 |
| — retinal, due to anaemia ... | 1. 338 | — — moulding of, <i>cf.</i> also Moulding | |
| — risk of, in multiple pregnancy ... | 1. 285 | — — movements of, during delivery ... | 1. 197 |
| — secondary ... | 11. 228, 378, 380 | 128, 138, 200 | |
| — symptoms of ... | 11. 234 | — — perforation of ... | 11. 339 |
| — treatment of ... | 1. 521, 523, 532, 543, | — — perforation of, <i>cf.</i> Perforation | |
| 11. 234, 239, 381 | | — — position of, <i>cf.</i> Position | |
| — uterine ... | 1. 505, 530, 11. 226, 233, 378 | — — presentations of, <i>cf.</i> Presenta- | |
| — bibliography ... | 11. 389 | tions. | |
| — diagnosis of ... | 11. 381 | — — rotations of ... | 1. 198, 199, 201 |
| — due to infectious disease ... | 1. 352 | 215, 216, 220 | |
| — effect on fetus ... | 1. 506 | — — shape of, <i>cf.</i> also Moulding. | |
| — physical signs of ... | 11. 233 | — — shape of, figures ... | 1. 213, 215, 217 |
| — prophylaxis ... | 11. 234 | 227 | |
| — treatment of ... | 1. 521, 544, | — — shape of, in face presenta- | |
| 11. 234, 381 | | tions ... | 1. 227 |
| — unavoidable ... | 1. 538 | — — shape of, in face-vertex pres- | |
| — warm irrigations for ... | 1. 523, 11. 238 | entations ... | 1. 217 |
| — with tubal pregnancy ... | 1. 423 | — — shape of, in occipito-anterior | |
| Hæmorrhage diathesis causing atony ... | 11. 232 | presentations ... | 1. 129 |
| diathesis during pregnancy ... | 1. 339 | — — size of ... | 1. 123, 129 |
| — endometritis ... | 1. 351, 354 | — — size of, how diagnosed ... | 11. 83 |
| Hæmorrhage in hæmorrhage ... | 11. 235, 238 | — — super-rotations of, <i>cf.</i> Super- | |
| Hair, development of ... | 1. 119, 120 | rotations. | |
| loss of, during puerperal state ... | 1. 290 | — — sutures of ... | 1. 118, 119 |
| Hæmorrhage, retroceps of ... | 11. 355 | — — sutures of, <i>cf.</i> also Sutures | |
| Hand diagnosed from foot ... | 1. 237 | — — swelling due to labour, <i>cf.</i> | |
| — feeding by ... | 1. 328, 333 | Caput | |
| — introduction of, into uterus for | | — — variation in size of ... | 1. 135 |
| hæmorrhage ... | 11. 237 | — — hardness of, how diagnosed ... | 1. 81 |
| — — — — for removal of placenta ... | 11. 254 | Headless monster ... | 11. 57 |
| — selection of, in version ... | 11. 520 | Heating, power of, at birth ... | 1. 135 |
| Head, after-coming, application of | | Heart affected in puerperal fever ... | 1. 144, |
| forceps to ... | 11. 549, 576 | 146, 147 | |
| — management of ... | 1. 218, 219, 11. 87 | — change in, during pregnancy ... | 1. 83 |
| — perforation of ... | 11. 87, 598 | — disease, causing a curved form ... | 11. 64 |
| — foetal, alteration of shape during | | — dangers of, during puerperium ... | 11. 64 |
| delivery ... | 1. 201 | — during pregnancy ... | 1. 361, 362 |
| — — — — <i>cf.</i> Moulding. | | — during puerperium, betha- | |
| — asymmetry of, after labour ... | 1. 214 | graphy ... | 1. 361, 11. 46 |
| — attitude of ... | 1. 127, 11. 83, 86 | — rupture of, after delivery ... | 11. 57 |
| — brachycephalic ... | 1. 126, 217, 222, 242 | Heart sounds during puerperal state ... | 1. 146 |
| — caput succedaneum of, <i>cf.</i> | | — — foetal, in hydranitis ... | 1. 46 |
| Caput. | | — — proof of living fetus ... | 1. 10 |
| — compared to lever ... | 1. 126, 199 | | |

	PAGE
Hymen, imperforate, bibliography ...	11. 159
— integrity of, after coitus ...	11. 141
— laceration of, during labour ...	11. 141
— ragidity of ...	11. 141
Hyperaesthesia during pregnancy ...	1. 88
Hyperkinesia in new-born child ...	1. 315
Hyperostosis, rickets ...	11. 18
Hyperplasia of chorion ...	1. 451
Hyperplasia of decidua ...	1. 409
Hypertrophy of abdominal walls	
during pregnancy ...	1. 81, 157
— of anterior lip of cervix ...	11. 148
— — cervix ...	11. 137, 138
— — decidua ...	1. 409
— — heart during pregnancy ...	1. 85
— — placenta ...	1. 467
Hypoblast ...	1. 90
Hypochlorite of soda as disinfectant ...	11. 464
Hypochondria, effect of pregnancy on ...	1. 81
Hypochondriac regions, contents of ...	1. 6
Hypochondriasis during pregnancy ...	11. 415
Hypogastrum, contents of ...	1. 7
Hypoplasia of decidua ...	1. 447
Hypophleites as disinfectants ...	11. 464
Hysteria, diagnosis from eclampsia ...	11. 218
— in nursing woman ...	1. 321
Hysterocle ...	1. 381
Hysterotomy, cf. Cæsarian section.	
— for hernia ...	1. 383
I.	
Ice in treatment of mastitis ...	11. 408
— in treatment of peritonitis ...	11. 475
Ice-bag causing gangrene ...	11. 241
Ichochromia ...	11. 445
Icterus during pregnancy ...	1. 351, 357
— during pregnancy, bibliography ...	1. 370
— in new-born child ...	1. 312, 313
— in new-born child, bibliography ...	1. 316
Iliac abscess in puerperal fever ...	11. 141
— — — distance apart ...	1. 9. 11. 32
— — — spines, distance apart ...	1. 9. 11. 32
— — — spines, distance between pos- ter or superior ...	11. 36
Ilio-sacral joint, ankylosis of ...	11. 93
— — inflammation of ...	11. 100
— — injury to ...	11. 322, 324, 325
— — injury to, bibliography ...	11. 327
— — of testis, injury to ...	11. 352
Immissio penis, without rupture of hymen ...	11. 141
Impaction of cervix ...	1. 386, 11. 64, 272
— of head in pelvic contraction ...	11. 71
— of uterus, cf. Incarceration.	
Imperforate hymen ...	11. 141
— — bibliography ...	11. 159
Impetigo herpesiformis of pregnancy ...	1. 346
Impotentia gestandi ...	1. 511
Impregnation ...	1. 64
— per urithrum ...	11. 198
Incarceration of ante flexed uterus ...	1. 388

Incarceration of fibroid	...	1, 491
— placenta	...	11, 247
— prolapsed uterus	...	1, 488
— retroflexed uterus	...	1, 489, 490
Incisions in uterus of genital canal	...	1, 449
— of scalp before perforation	...	11, 388
— required by cancer of cervix	...	1, 450
— through perineum	...	1, 489
Inclination, abnormal, of pelvis	...	11, 38
— excessive, of pelvis	...	11, 38
— normal, of pelvis	...	1, 448
— of outlet	...	1, 448
— pelvis	...	1, 448
— pelvis, affected by posture	...	11, 38
— symphysis, figure	...	11, 38
— uterus to right	1, 492, 74, 76, 221, 28	
Inclusion of foetus	...	11, 73
Incontinence of succus	...	11, 46
— of flatus	...	11, 46
— of urine	...	1, 80, 11, 28
— of urine due to fistula	...	11, 62
Index finger in vaginal examination	...	1, 49
Indian bump is oxytocic	...	11, 41
India-rubber bags in inducing labour	11, 496	
— in treatment of haemorrhoids	...	1, 49
— in uterine hemorrhage	1, 543, 11, 49	
— in uterine inertia	...	11, 49
— used to plug vagina	...	1, 543
— pelvis	...	11, 49
— shield for sore nipple	...	1, 544
— test	...	11, 492, 49
Induction of abortion	11, 496, 506, 511	
— bibliography	...	1, 506
— of also Abortion.		
— of premature labour	11, 488, 496, 502	
— bibliography	...	11, 496, 502
— dangers	11, 489, 49, 504	
— history	...	11, 488
— in eclampsia	11, 218, 22	
— on account of disease	...	11, 496
— prognosis	...	11, 496
— time for	11, 493, 492	
Induration of lungs in syphilis	...	11, 66
Inertia due to pelvic contraction	...	11, 67
— during dilatation period	...	11, 67
— during expulsion period	...	11, 67
— of uterus	...	11, 67
— causes	...	11, 67
— sequelae	...	11, 67
— treatment	...	11, 67
— with placenta previa	...	1, 496
— with twins	...	1, 271
Infant, artificial feeding of	...	1, 525
— care of	...	1, 525
— of also Foetus, New-born child		
— circulation of	...	1, 526
— death of	...	1, 522, 52
— digestion of	...	1, 521
— icterus of	...	1, 522, 521
— mammary glands of	...	1, 521

- | | PAGE | | PAGE |
|--|---------------------------|--|--------------------------------|
| Infant, respiration of... | 1. 308 | Injuries of pelvic joints, <i>cf.</i> Articulations. | |
| — sero-sanguineous swelling | 1. 310 | — uterus, from rubbing | 11. 291 |
| — — — <i>cf.</i> also Caput. | | — uterus, from sharp edges | 11. 291 |
| — urine of | 1. 311 | — vagina during labour | 1. 417, 11. 296, 327 |
| — weight of | 1. 314 | Inlet of pelvis | 1. 8, 11. 14 |
| Infarct, renal, in new-born child | 1. 133, 312 | — of pelvis, diameters of | 1. 12 |
| Infection at umbilicus | 11. 479 | Innervation of uterus, abnormal | 11. 3 |
| — auto-genetic | 11. 421 | Inoculation in puerperal fever | 11. 429 |
| — disinfection of accoucheur after | 11. 463 | — of cervix | 11. 452 |
| — in puerperal fever | 11. 421, 425, 461 | Insanity during lactation | 11. 419 |
| — malarial, <i>cf.</i> Malarial | | — during parturition | 11. 416 |
| — of new-born child | 11. 476, 478 | — during pregnancy | 11. 415 |
| — — — bibliography | 11. 482 | — post partum | 11. 416 |
| — puerperal, how conveyed | 1. 252 | — puerperal | 11. 413 |
| — puerperal, prevention of | 1. 253, 11. 461 | — puerperal, bibliography | 11. 420 |
| — septic, of fetus | 11. 477, 478 | — puerperal, causes | 11. 413, 414 |
| — septic, of new-born child | 11. 476, 482 | — puerperal, frequency | 11. 413 |
| Infectious diseases causing intra-uterine death | 1. 497 | — puerperal, treatment | 11. 414, 419 |
| — during pregnancy | 1. 351 | — suicidal | 11. 415 |
| — — — bibliography | 1. 370 | Insertio, <i>cf.</i> Insertion. | |
| — effect on fetus | 1. 351 | Insertion of placenta | 1. 105 |
| Inflammation of breast, <i>cf.</i> Mammary glands. | | — — — contraction of area of | 1. 185 |
| — of genital canal | 11. 9, 435, 437 | — — — effect on inversion | 11. 262 |
| — of hip-joint affecting pelvis | 11. 98, 99 | — — — into lower segment of uterus | 11. 528, 534 |
| — of ilio-sacral articulation | 11. 100 | — of umbilical cord, central | 1. 115 |
| — of pleura, <i>cf.</i> Pleurisy. | | — — — forked | 1. 115 |
| Inflammatory constriction of fetus | 11. 22 | — — — lateral | 1. 115 |
| Inflation of chest at birth | 1. 308 | — — — marginal | 1. 115, 272, 280 |
| — of fetal lung | 11. 361 | — — — velamentous | 1. 115, 272, 280, 11. 226, 332 |
| — of lungs in asphyxia | 11. 369, 372 | Inspection of internal organs | 1. 149 |
| Infundibuliform contracted pelvis | 11. 91 | — of vulva after delivery | 11. 306 |
| — — — aetiology | 11. 92 | Instability of lie | 1. 128, 131, 11. 59 |
| — inverted pelvis | 11. 93 | Instruments, disinfection of | 1. 252 |
| — justo major pelvis | 11. 26 | — obstetrical | 11. 486 |
| — pelvis | 11. 26, 91, 324 | Insufflation in asphyxia | 11. 369, 372 |
| — — — bibliography | 11. 132 | Intercoarse, sexual, after abortion | 1. 521 |
| — — — injuries caused by | 11. 93 | — — <i>cf.</i> Coitus, Sexual. | |
| — — — rupture of | 11. 324 | — — during pregnancy | 1. 179 |
| — — — treatment | 11. 92 | Interlocking of twins | 1. 282 |
| Infundibulo-ovarian ligament | 1. 37 | Intermittent fever during pregnancy | 1. 356 |
| Infundibulo-pelvic ligament | 1. 36 | — — — bibliography | 1. 370 |
| Infundibulum | 1. 33 | Internal version, <i>cf.</i> Version. | |
| Inguinal uterine hernia | 1. 382 | Interrogation of patient | 1. 140 |
| Inhalation of chloroform, <i>cf.</i> Chloroform | | Interstitial placentitis | 1. 468 |
| — — liquor amnii | 11. 357, 361, 364 | — pregnancy | 1. 426, 427 |
| — — meconium | 11. 361, 364 | — pregnancy, diagnosis | 1. 428 |
| Inhaled matters, removal of | 11. 367, 370 | Intertigo in new-born child | 1. 312, 326 |
| Injection of placenta before removal | 11. 257 | Intestine in new-born child | 1. 311 |
| — — uterus for inducing pains | 11. 496, 499 | — prolapse of, after rupture of uterus | 1. 416, 11. 280, 283 |
| Injections, <i>cf.</i> also Irrigations, Vagina. | | — — — after tear of vagina | 11. 298 |
| — dangers of | 11. 345, 351 | — strangulation of, by inverted uterus | 11. 261 |
| — hot water | 1. 523, 11. 238, 258, 381 | Intoxication, septic | 11. 421, 423, 444 |
| — hot water, bibliography | 11. 258 | — septic, of infant | 11. 476 |
| Injuries caused by normal delivery | 11. 422 | — uræmic, in eclampsia | 11. 211 |
| — of cervix during labour | 11. 293, 327 | Intra-abdominal pressure | 1. 80, 81, 178 |
| — of fetus during labour | 11. 546, 552 | Intra-cranial cephalothrasy | 11. 5 |
| — of fetus produced during delivery | | | |
| — — — — — bibliography | | | |

- PAGE
- Intra-uterine curvatures ... 1. 485
- death ... 1. 165, 354, 496
- death, causes ... 1. 197
- detachment of limbs ... 1. 486
- dislocations ... 1. 485
- fibroids ... 11. 145
- fractures ... 1. 483
- hæmorrhage, *cf.* Hæmorrhage.
- irrigation... 11. 468
- irrigation, *cf.* also Irrigations.
- migration of ovum ... 1. 420
- pregnancy co-existing with
- extra-uterine ... 1. 435
- pressure ... 1. 190, 191
- suicide ... 1. 477
- vaccination ... 1. 353
- Intra-vaginal auscultation ... 1. 149
- Intra-vaginal fibroids... 11. 145
- Inversion of uterus ... 11. 259, 260, 263
- — — after abortion ... 1. 517, 11. 260
- — — bibliography ... 11. 260
- — — after precipitate labour... 11. 18
- — — bibliography ... 11. 262, 270
- — — by new growth ... 1. 400, 11. 260
- — — causes ... 11. 260
- — — causing atony ... 11. 245
- — — combined with prolapse 11. 259
- — — diagnosis ... 11. 266
- — — diagrams ... 11. 259
- — — due to manual pressure... 11. 262
- — — due to traction on cord ... 11. 262
- — — due to traction on placenta 11. 262
- — — due to tumour ... 1. 400, 11. 260
- — — frequency ... 11. 260
- — — passive ... 11. 261
- — — prognosis ... 11. 265
- — — sequelæ ... 11. 264
- — — spontaneous re-position ... 11. 265
- — — symptoms ... 11. 263
- — — treatment ... 11. 264, 267
- — — varieties ... 11. 259
- Inverted infundibuliform pelvis ... 11. 93
- Inverted pelvis ... 11. 130
- Involuntary-muscular plate ... 1. 90
- Involution, anomalies of ... 11. 375
- clinical phenomena of ... 1. 288, 317
- delayed by hydramnios ... 1. 464
- of broad ligaments ... 1. 296
- — cervix uteri ... 1. 295
- — Fallopian tubes ... 1. 296
- — labia majora ... 1. 297
- — mammary glands ... 1. 302
- — nymphæ ... 1. 297
- — round ligaments ... 1. 296
- — uterine mucosa ... 1. 293
- — uterus... 1. 292, 294
- — uterus after abortion ... 1. 517
- — vagina ... 1. 296
- — puerperal ... 1. 287, 288
- Iodide of potassium, action on lacteal secretion ... 1. 324
- — — in salivation of pregnancy 1. 345
- Iodine as hæmostatic ... 11. 23
- for chronic indurations ... 11. 41
- in galactorrhœa ... 11. 41
- in phlegmasia alba dolens 11. 388, 389
- Iodoform for chronic indurations ... 11. 41
- Ipecacuanha in puerperal fever ... 11. 45
- in uterine spasm ... 11. 45
- Iron in eclampsia ... 11. 239
- in galactorrhœa ... 11. 41
- in hydriemta ... 1. 337
- in phlegmasia alba dolens 11. 388
- in salivation of pregnancy ... 1. 345
- perchloride of, as hæmostatic ... 1. 345
- Irrigations after delivery ... 11. 466
- *cf.* also Douche.
- danger accompanying uterine ... 11. 345
- — — bibliography ... 11. 345
- during labour ... 11. 259
- for after-pains ... 11. 345
- for hæmorrhage... 11. 237, 258, 261
- hot water, ... 1. 523, 11. 2, 238, 258, 261
- in eclampsia ... 11. 239
- of bladder in cystitis ... 11. 345
- — uterus, continuous ... 11. 466
- — vagina after labour ... 1. 265, 317, 318
- — vagina during abortion 1. 520, 317
- — vagina during pregnancy ... 1. 138
- — vagina in inducing pains 11. 486, 487
- — vagina in uterine inertia 11. 466
- Irrigator ... 11. 239
- Iscchiadic hernia of uterus ... 1. 381
- Iscchal planes, effect on head 1. 299, 245
- spines, distance apart ... 1. 3
- spines, effect on head 1. 299, 244
- tuberosities, distance apart ... 11. 60
- Ischuria after delivery ... 11. 376
- *cf.* also Urine, retention of.
- paradoxica ... 1. 389, 11. 35
- Isthmus of Fallopian tube ... 1. 30
- of uterus... 1. 48, 11. 257
- J.
- Jalap in eclampsia ... 11. 321
- Jamming of cervix ... 1. 386, 11. 60, 257
- of head ... 1. 71
- of uterus, *cf.* Incarceration.
- Jaundice during pregnancy ... 1. 351, 357
- — — bibliography ... 1. 357
- — — in new-born child 1. 312, 341
- — — bibliography ... 1. 357
- Jaws, development of... 1. 117, 118
- injury to, during labour ... 11. 57
- traction on, in delivery of head 11. 541
- Jelly of Wharton ... 1. 113, 246
- — — affected by knots... 1. 47
- — — affected by torsion 1. 479, 480
- — — development of ... 1. 113
- — — local bulging of ... 1. 480

	PAGE
<i>cf. also</i> Articulations.	
vic, during pregnancy	I. 15, 78, 414
vic, rupture of, during labour	II. 79, 321
side-forceps of	... II. 555
viscous cephalique of	... II. 598

K.

affected in eclampsia	II. 204, 210, 213, 216
affected in puerperal fever	... II. 446
<i>cf. also</i> Albuminuria.	
atic degeneration of	... II. 169
— bibliography	... II. 169
ease of, necessitating abortion	II. 502
ital and liquor amnii	I. 102, 103
imitive	... I. 117
ic acid infarcts of	... I. 312
ic during pregnancy	... I. 87
on osteo-malacic pelvis	... II. 113
spinous pelvis	II. 50, 129
spondylolisthetic pelvis	... II. 119
on extraction of head	... II. 538
n induction of labour	II. 496, 501
ing of uterus for hæmorrhage	II. 236
resentations	... I. 204, 238
resentations, diagnosis	... I. 238
esion with	... II. 520
low posture causing physio-	
metra	... II. 345
<i>cf. also</i> Genu-pectoral, Posture.	
in reposition of cord	II. 339, 340, 341
of cord	I. 114, 115, 476
— causing death of fœtus	I. 477
orhexis	... II. 297
ne, <i>cf.</i> Kiestine.	
ic pelvis	... II. 105, 107
— bibliography	... II. 132
— diagnosis	... II. 111
— dystocia due to	... II. 111
— figures of	II. 108, 111
— treatment of labour in	... II. 112

L.

adhesion of	... II. 141
anges in, during pregnancy	I. 77
ajora	I. 29, 45
ajora, puerperal involution of	I. 287
linora, <i>cf.</i> Nymphæ	I. 30, 45
edema of	I. 81, 310, II. 143
is uteri	... I. 31
— during pregnancy	... I. 73
— erosion of	I. 73, 413, II. 422
alveæ, sebaceous glands of	... I. 45
—	... I. 171
ation of abdominal muscles in	I. 171, 177
— expulsive forces in	I. 171, 175, 177
— vagina in	... 78

Labour, anaesthesia during	... I. 266
— antiseptics during	I. 252, 253, II. 463, 464
— antiseptics during, <i>cf. also</i> Carbolic.	
— armamentarium required during	I. 251
— bag of waters during	I. 180, 181
— bibliography of difficult	II. 25, 131, 159, 169, 203
— bibliography of normal	... I. 249
— <i>cf. also</i> Parturition.	
— chloroform during	... I. 266
— clinical progress of	... I. 171
— collapse during	... II. 349
— complications of	II. 1, 58, 134, 160, 204
— contractions of uterus during	I. 172, 175, 176
— date of, how predicted	I. 65, 158
— death of child during, <i>cf.</i> Asphyxia.	
— death of mother during	II. 349
— deferred	... I. 161
— determining cause of	... I. 171
— diagnosis of recent	... I. 305
— difficult	... II. 1, 3
— <i>cf.</i> Labour, complications of.	
— duration of	I. 186, 187, 228, II. 41
— — — and puerperal fever	... II. 430
— dynamics of	... I. 191
— effect on anus	I. 182, 183
— — — fetal head, <i>cf.</i> Head.	
— — — intra-abdominal pressure	I. 178
— — — perineum	... I. 182
— — — perineum, <i>cf. also</i> Perineum.	
— — — weight of mother	... I. 186
— ergot during, <i>cf.</i> Ergot.	
— examination during	I. 252, 253, 254, 255
— followed by exhaustion	... I. 184, II. 79, 349
— hæmorrhage during	... I. 180
— induction of premature, <i>cf. also</i> Induction	... II. 488
— insanity during	... II. 416
— irrigations during	... I. 253
— lacerations during, <i>cf.</i> Ruptures.	
— management of	... I. 250
— mania during	... II. 416
— mechanism of	... I. 188
— — — <i>cf. also</i> Breech, Face, Brow presentations, &c.	
— missed	... I. 501, 502
— obstructed by atresia	... II. 134
— — by cicatrix	... II. 134
— — by rigid hymen	... II. 141
— — by rigid perineum	... II. 142
— — by thick frænum	... II. 142
— <i>cf.</i> Dystocia.	
— painless	... I. 177
— pains of	... I. 175, 176
— pathology of	... I. 334, II. 1
— periods of	I. 179, 182, 184
— posture during normal	I. 255, 256, 259

	PAGE		PAGE
Labour, precipitate, <i>cf.</i> Precipitate.		Laparotomy	1, 428, 443, 444, 445
— premature, <i>cf.</i> Premature.		— after rupture of uterus	11, 284
— preliminary signs of	I, 174	— bibliography	11, 284, 285
— preservation of perineum during,		— <i>cf.</i> also Caesarian section, Gas-	
<i>cf.</i> Perineum.		trotony.	
— protracted, and puerperal fever	11, 430	— in puerperal fever	11, 435
— protracted, causing rupture	11, 273	Late pregnancy, ease of	1, 52
— pulse during, <i>cf.</i> Pulse.		Lateral obliquity of head, <i>cf.</i> Obliquity	
— rupture of membranes, <i>cf.</i> Mem-		Laudanum	1, 252
branes.		— <i>cf.</i> also Morphia, Opium	
— ruptures during, <i>cf.</i> Ruptures.		— in structure of uterus	11, 298
— signs of	I, 174	— in treatment of hæmorrhage	11, 242, 243
— stages of	I, 179, 182, 184	Lead, acetate of, in abortion	1, 522
— support of perineum during	I, 258	— band, instead of fillet	11, 50
— temperature during, <i>cf.</i> Tem-		— lotion for cystitis	11, 36
perature.		— lotion for intertrigo	1, 32
— time of commencement	I, 187	— lotion for sore nipples	1, 32
— uterine mucosa after	I, 293	— shield for sore nipples	1, 32
— with monsters	11, 172	Leashes in parametritis	11, 65
— with pelvic contraction	11, 58, 67, 92,	Leg, marble	11, 36
	103, 111, 118	— selection of, in version	11, 59, 62
— — — — bibliography	11, 132	Legitimate pregnancy shorter than	
— — — — procidentia uteri	I, 177	illegitimate	1, 55
— — — — quadruplets	I, 286	Legs, oedema of, during pregnancy	1, 81, 83, 86
— — — — triplets	I, 286	— thrombosis of, post partum	11, 29
— — — — twins	I, 270	— varicos of, during pregnancy	1, 81
Lacerations, <i>cf.</i> also Ruptures.		Leisnig, trephine of	11, 52
— of cervix	11, 293	Length of foetus	1, 115, 121, 122, 160
— of hymen during labour	11, 141	— of foetus, for calculating period	
— of parturient canal	11, 270	of pregnancy	1, 144
— of portio vaginalis	11, 293	— of pregnancy	1, 63, 161
— of uterus	11, 270	— of pregnancy, bibliography	1, 166
— of vagina introitus	11, 303	Leucocytosis of pregnancy	1, 84
— of vestibule	11, 303	Leucorrhœa during pregnancy	1, 43
Lacing, tight, during pregnancy	1, 357	Lever	11, 553, 557
Lactate of sodium	11, 419	— action of forceps	11, 560
Lactation, continuance of, during ill-		— foetus compared to	11, 47
ness	I, 324, 11, 400, 402, 403, 411, 459	— head of foetus compared to	1, 199, 205, 226
— diet during	I, 320, 323	Levret, forceps of	11, 554, 556
— disorders of	11, 339	— hook of	11, 604
— duration of	1, 301	— method of extraction of	11, 585, 537, 540
— effect of puerperal fever on	11, 459	— on version	11, 624
— excessive supply of milk during,		— Veit method of extracting	
<i>cf.</i> Galactorrhœa.		head	11, 537, 538, 540
— insanity during	11, 419	Lex regia	1, 357, 11, 367
— means of arresting	I, 324, 11, 400	Liberation of arms	11, 162, 534, 535
— relat on to menstruation	I, 302	Lie of foetus, bibliography	1, 148
Lactal fistula	11, 407, 411	— — — cephalic	1, 128, 204, 205
— secretion, <i>cf.</i> Mammary secretion.		— — — definition of	1, 127, 128
Lactiferous ducts, plugging of	1, 323	— — — diagnosis of	1, 207, 208
Lactobutyrometer	1, 327	— — — how changed	1, 145
Lactose, amount of, in milk	1, 304	— — — in utero	1, 127, 128
Lactosuria during puerperal state	1, 291	— — — influence of pelvis on	11, 38
Lambshead suture	1, 124	— — — instability of	1, 134, 11, 38
Lamioaria tents	1, 523, 546	— — — longitudinal	1, 128, 204
— tents, <i>cf.</i> also Tents.		— — — oblique	1, 209, 205
— tents in clamping cervix	11, 246	— — — pelvic	1, 133, 204, 205
— tents in inducing pains	11, 498, 499	— — — transverse	1, 128, 205, 11, 191
Landonvy, paralysis of	11, 566	— — — transverse, <i>cf.</i> also Pres-	
Lanugo	I, 118, 120, 121	entation, transverse.	
Laparoselytomy	11, 615		
— bibliography	11, 624		

- | | PAGE | | PAGE |
|---|----------------------|--|-------------------------------------|
| Leibig's soup | 1. 332 | Liquor amnii, composition of ... | 1. 102 |
| Life of foetus, diagnosis of ... | 1. 164 | — — deficiency of ... | 1. 459, 461, 11. 201 |
| Ligament, areiform, in pelvimetry ... | 11. 33 | — — derivation of ... | 1. 102, 103 |
| — broad | 1. 34, 36, 296 | — — diminution of, after foetal death ... | 1. 165, 449 |
| — infundibulo-ovarian | 1. 37 | — — discharge of ... | 1. 181, 255, 11. 5, 10, 63 |
| — infundibulo-pelvic | 1. 36 | — — discharge of, premature ... | 11. 63, 200 |
| — ovarian | 1. 34 | — — effect of discharge on umbilical souffle ... | 1. 148 |
| — pubo-vesical | 1. 39 | — — excess of, <i>cf.</i> Hydramnios ... | |
| — round | 1. 37, 77, 178, 296 | — — inhalation of ... | 11. 357, 361, 364 |
| Ligaments, broad, involution of ... | 1. 296 | — — insufficiency of ... | 1. 459, 461, 11. 201 |
| — of child injured during delivery ... | 11. 551 | — — premature discharge of ... | 11. 199, 200, 203 |
| — round, as expelling agent ... | 1. 178 | — — renal origin ... | 1. 103 |
| — uterine, loosening of ... | 11. 59, 66 | — — spurious ... | 1. 101, 182, 277, 412, 11. 185 |
| — uterine, stretching of ... | 11. 59, 66 | — — sugar in ... | 1. 462 |
| Ligamentum arteriosum | 1. 309 | — — uses of ... | 1. 103 |
| — <i>cf.</i> also Ligament. | | Liquor ferri perchloridi as haemostatic ... | 1. 549, 11. 238, 246, 296, 300, 306 |
| — latum, <i>cf.</i> Ligament, broad. | | — folliculi ... | 1. 54 |
| — rotundum, <i>cf.</i> Ligament, round. | | Listerism, <i>cf.</i> also Carbolic, Disinfection. | |
| — vesicale laterale | 1. 309 | — in midwifery ... | 11. 463 |
| Ligation of cord, best time for ... | 1. 262 | Lithopædion ... | 1. 425, 433, 435, 502 |
| — — bibliography ... | 1. 270 | — composition of ... | 1. 433 |
| — — premature ... | 1. 262, 11. 368 | — formation of, after uterine rupture ... | 11. 285 |
| — — with twins ... | 1. 284 | — in lower animals ... | 1. 502 |
| Limb, disuse of, causing pelvic deformity ... | 11. 98 | Lithotomy during labour ... | 11. 158 |
| Limbs, foetal, abnormal curvature of ... | 11. 177 | — posture during operations ... | 11. 312, 486, 518, 530, 567, 585 |
| — — amputation of ... | 1. 460, 486 | Lithotripsy ... | 11. 158 |
| — — amputation of, bibliography ... | 1. 505 | Litzmann on split pelvis ... | 11. 130 |
| — — ankylosis of ... | 11. 177 | Liver, acute atrophy of, during pregnancy ... | 1. 357 |
| — — development of ... | 1. 117 | — affected in puerperal fever ... | 11. 446 |
| — — fracture of ... | 1. 484 | — change in position after parturition ... | 1. 6 |
| — — injury to, during labour ... | 11. 548 | — syphilitic changes in ... | 1. 491, 493, 496, 11. 163 |
| — — intra-uterine detachment of ... | 1. 486 | — tumours of, causing dystocia ... | 11. 170 |
| — — presentation of ... | 11. 194 | Living foetus, diagnosis of ... | 1. 164 |
| — — — <i>cf.</i> also Arm, Knee. | | — foetus, perforation of ... | 11. 580, 581 |
| — — prolapse of ... | 11. 60, 89, 194, 195 | Lochia alba ... | 1. 300 |
| — — prolapse of, bibliography ... | 11. 203 | — anomalies of ... | 11. 376 |
| — — twisting of cord round ... | 1. 478 | — bibliography ... | 1. 308 |
| — — neuralgia of, after delivery ... | 11. 397 | — cause of odour of ... | 1. 300 |
| — — paralysis of ... | 11. 322, 396 | — composition of ... | 1. 300 |
| — — paralysis of, bibliography ... | 11. 399 | — cruenta ... | 1. 299 |
| Lime, chlorinated, in colpitis ... | 11. 474 | — definition ... | 1. 294, 299 |
| — deposit of, <i>cf.</i> Calcareous. | | — in extra-uterine pregnancy ... | 1. 432 |
| — foetal production of ... | 1. 133 | — lactea ... | 1. 300 |
| — phosphate of, in hydremia ... | 1. 337 | — obstructed by hematoma ... | 11. 318 |
| — salts, insufficiency of, in rickets ... | 1. 488 | — obstructed by thrombus ... | 11. 818 |
| Linea arcuata interna in rickety pelvis ... | 11. 47, 50 | — offensive odour of ... | 1. 300, 11. 377 |
| — innominata ... | 1. 8, 11 | — quantity of ... | 1. 300 |
| — terminalis ... | 1. 8, 11 | — reaction of ... | 1. 299 |
| Lip, <i>cf.</i> Labia, Cervix. | | — serosa ... | 1. 399, 300 |
| Lipoid transformation of foetus ... | 1. 499 | — sudden arrest of ... | 11. 377, 454 |
| Lipomata, causing dystocia ... | 11. 170 | Lochionetra ... | 11. 377 |
| Liquor amnii ... | 1. 93, 101, 180 | Locking of forceps ... | 11. 570 |
| — — abnormal composition of ... | 1. 460 | — of twins ... | 1. 282, 283 |
| — — absorption of, after foetal death ... | 1. 165, 449 | | |
| — — action on os uteri ... | 1. 180 | | |
| — — anomalies of ... | 1. 460, 11. 201 | | |
| — — artificial removal of ... | 11. 10, 500 | | |
| — — changes in, after death of foetus ... | 1. 500 | | |

- PAGE
- Locomotion impeded ... II. 322, 396, 399
 Lohm's food for infants ... 1. 332
 Lohm, forceps perforator of ... II. 598
 Longus during pregnancy ... 1. 169
 Longitudinal lie of foetus ... I. 128, 204
 Lordosis in kyphotic pelvis ... II. 108
 — of spine ... 1. 334
 Lotio plumbi for intertrigo ... 1. 326
 — for sore nipples ... 1. 324
 — in cystitis ... II. 393
 Lotron, Carbolie, *cf.* Carbolie.
 Loton, lead, *cf.* Lotio plumbi.
 Löwenhardt on duration of preg-
 nancy ... 1. 65
 Lower segment of uterus ... 1. 75
 — — — *cf.* also Lower
 — — — in placenta previa ... 1. 534
 — — — margin of, to be felt ... II. 64
 — — — placental insertion into ... 1. 528
 — — — rupture of ... II. 270, 275
 Lumbar lordosis in kyphotic pelvis ... II. 108
 — vertebra, confusion with pro-
 montory ... II. 37
 Lumbo-sacral articulation, injury to ... II. 322
 Lungs affected in puerperal fever ... II. 446
 — diseases of, during pregnancy
 1. 351, 361, 371
 — effect of pregnancy on ... 1. 85
 — emphysema of ... II. 19
 — emphysema of, bibliography ... II. 19
 — inflammation of, during preg-
 nancy ... 1. 302
 — inflation of, at birth ... 1. 308
 — inflation of foetal ... II. 361
 — syphilitic changes in ... 1. 491, 492, 496
 Lutrum, corpus, *cf.* Corpus
 Lying in hospitals and puerperal
 fever ... II. 432
 — hospitals, antiseptics in ... II. 432, 445
 — period, *cf.* Puerperal state,
 Childbed.
 — woman, condition of, *cf.* Puer-
 peral state.
 Lymphatic parametritis ... II. 457
 — septicæmia ... II. 423, 442, 444, 451
 Lymphatics of cervix ... 1. 51
 — of uterus ... 1. 51, 67

M.

- Maceration of embryo ... 1. 419
 — of foetus ... 1. 499
 — of foetus and puerperal fever ... II. 131
 Magnesium sulphate of ... 1. 319
 Malignant, *cf.* Osteo-maligna ... II. 112
 Malaria during lying-in period ... 1. 356
 — during pregnancy ... 1. 356
 — during pregnancy, bibliography ... 1. 370
 Malay pelvis ... 1. 24
 Male pelvis contrasted with female ... 1. 22
 Malformations of foetus ... 1. 459, 478, 483, 485,
 II. 160, 165, 172
 Malformations of foetus, bibliography
 — of pelvis, *cf.* Deformities
 — of sexual organs ... 1. 371
 Malignant disease during pregnancy
 — of uterus ... 1. 393
 — of vagina ...
 — of vagina, bibliography ...
 Mamma, *cf.* Mammary glands
 Mammalia, usual foetal presentation in
 Mammary cysts ... II.
 Mammary glands, abnormal sen-
 sations in
 — — — affections of, after delivery
 — — — affections of, bibliography
 — — — affections of, in puerperal fever
 — — — alternate use of ...
 — — — anatomy of ...
 — — — bibliography of ...
 — — — care of, during pregnancy
 — — — changes in, after death of
 foetus ...
 — — — changes in, during pregnancy
 — — — characters of, in multipara
 — — — characters of, in primipara
 — — — cleansing of, after nursing
 — — — condition of, after delivery
 — — — enlargement of, during preg-
 nancy ...
 — — — examination of ...
 — — — in extra-uterine pregnancy
 — — — in newborn child ...
 — — — in puerperal state ...
 — — — inflammation of ...
 — — — involution of ...
 — — — pains in, during pregnancy
 — — — secretion in, during pregnancy
 — — — sensitiveness of, during men-
 struation ...
 — — — stricture of ...
 — — — swelling of, during men-
 struation ...
 Mammary secretion after delivery
 — — — bibliography ...
 — — — changes in the ...
 — — — characters of the ...
 — — — composition of the ...
 — — — during pregnancy ...
 — — — excessive ... 1. 320, 325
 — — — how affected by diet ...
 — — — how affected by suckling ...
 — — — influence of drugs on ...
 — — — treatment of scanty ...
 Management of breech presentation
 — — — brow presentation ...
 — — — face presentation ...
 — — — labour ...
 — — — lying-in woman ...
 — — — newborn child ...
 — — — pregnancy ...
 — — — puerperal state ...
 Manta, *cf.* also Lunacy.
 — due to eclampsia ...

	PAGE		PAGE
Mania during delivery ...	11. 116	Mechanism of twin labours ...	1. 281
— during lactation... ..	11. 120	— — vertex presentations... ..	1. 204
— puerperal... ..	11. 416, 417	Meconium	1. 119, 122
Manual examination of pelvis ...	11. 32, 36	— discharge of, after delivery ...	1. 311
Marasmus caused by hemorrhage ...	11. 234	— discharge of, in asphyxia ...	11. 361, 362
— causing thrombosis	11. 353	— inhalation of	11. 361, 364
— due to uncontrollable vomiting ...	1. 341	Medulla oblongata, containing motor	
Marble leg	11. 345	centre for uterus	1. 172
Mare, milk of, for infant	1. 328	Medullary plates	1. 90
lithopædion in	1. 502	Melancholia during delivery... ..	11. 418
Margin of lower segment of uterus ...	11. 64	— during lactation	11. 420
Marginal insertion of cord ...	1. 115, 272, 280, 541	— during pregnancy	11. 445
— sinus of placenta	1. 110, 536	Membrana granulosa	1. 54
Marital relations, <i>cf.</i> also Coitus.		Membrane, pupillary	1. 119
— relations during pregnancy ...	1. 170	Membranes, adhesion of, to decidua... ..	11. 136
Marriage, best age for	1. 62	— anomalies of	11. 198
Marshall Hall on artificial respiration ...	11. 369.	— artificial rupture of	11. 199
	370	— bag of, action on cervix ...	1. 180, 196
Mask of pregnancy	1. 88	— bag of, confused with cystocele ...	11. 157
Mastitis... ..	11. 403	— bag of, expelled unruptured ...	1. 181
— bibliography	11. 412	— bag of, in pelvic contraction ...	11. 62
— causes	1. 322, 11. 403	— bag of, in transverse presentation ...	11. 183.
— treatment	11. 408		185
— varieties	11. 404	— bag of, presentation of ...	1. 180, 190
Maternity hospitals, antiseptics in ...	11. 432, 465	— bag of, prolapse of ...	1. 181, 11. 199, 203
hospitals, hygienic state of ...	11. 432	— bag of, rupture of ...	1. 180, 181
Matter, forceps of	11. 556	— changes in, after death of foetus ...	1. 500
Matthieu, callipers of... ..	11. 32	— delayed rupture of	11. 199
Maturity of foetus, signs of	1. 121	— detachment of, bibliography ...	11. 258
— sexual	1. 59, 62	— expression of, after abortion ...	1. 525
— sexual, duration of	1. 62	— figures showing foetal ...	1. 95, 96
Mauriceau on extraction of head ...	11. 538	— foetal, hyperplasia of	1. 458
Meals, frequency of, for infant ...	1. 322, 330	— foetal, myxoma of	1. 458
Measles during pregnancy	1. 353	— force required to rupture ...	1. 191
— during pregnancy, bibliography ...	1. 370	— perforators for opening... ..	11. 199
Measurement of conjugata diagonalis ...	1. 15,	— premature rupture	11. 199
	11. 37	— premature rupture, bibliography ...	11. 203
— — conjugata vera	1. 12, 11. 38	— prolapse of	1. 181, 11. 199
— — foetal head	1. 125	— prolapse of, bibliography ...	11. 203
— — foetus	1. 115, 121, 122, 161	— puncture of, in inducing labour ...	11. 496
— — iliac crests	1. 9, 11. 32		500, 503
— — iliac spines	1. 9, 11. 32	— puncture of, in placenta prævia ...	1. 547
— — pelvic outlet	1. 13, 11. 40	— relation of, during expulsion of	
— — pelvis	1. 14, 11. 29, 31	placenta	1. 196
— — pelvis, bibliography	11. 132	— relation of, with twins	1. 271
— — pelvis, internal	11. 36	— retention of, in abortion	1. 513
— — uterus during pregnancy ...	1. 68	— rupture of, in uterine inertia ...	11. 10
— — uterus in non-gravid state ...	1. 32	— separation of, from uterus ...	11. 496
Meatus urinarius	1. 38	— two bags of, with twins ...	1. 278
Mechanical abortion	1. 508	— undue fragility of	11. 198
— — brow presentations	1. 232	— undue toughness of	11. 198, 252
— — face presentations	1. 224	Membranous placenta	1. 466
— — labour... ..	1. 188	Membres, confusion des	1. 282
— — labour, figure... ..	1. 194	Memory, loss of, in eclampsia ...	11. 209
— — labour, literature	1. 250	Meningitis caused by puerperal fever ...	11. 447
— — labour, with contracted pelvis ...	11. 67	Menopause	1. 61, 62
— — labour, with flat pelvis	11. 67	Menses, <i>cf.</i> Menstruation.	
— — labour, with generally con-		Menstruation	1. 60
tracted pelvis	11. 70, 71	— affected by climate	1. 62
— — pelvic presentations... ..	1. 238	— as a basis for calculating time	
		of delivery	1. 158
		— bibliography	1. 66

- | | PAGE | | PAGE |
|---|------------------------|---|----------------------|
| Menstruation, duration of | 1. 61 | Milk, deficiency of | 1. 305, 311, 399 |
| — during pregnancy | 1. 78, 352, 507 | — ducts, anatomy of | 1. 35 |
| — during pregnancy, bibliography ... | 1. 551 | — ducts, disease of | 11. 405 |
| — effect of climate on | 1. 61 | — ducts, plugging of | 1. 323 |
| — effect of pregnancy on | 1. 78 | — excess of | 1. 320, 323, 11. 399 |
| — effect on genital organs | 1. 60 | — fever | 1. 301 |
| — effect on mammary glands | 1. 61 | — flow of | 1. 57, 301 |
| — effect on ovary | 1. 60 | — food, Nestle's | 1. 342 |
| — in extra-uterine pregnancy | 1. 436 | — glands, necessary | 1. 57, 301 |
| — relation to lactation | 1. 302 | — globules | 1. 303 |
| — so-called, during pregnancy | 1. 78, 352, 507, 551 | — human, characters of | 1. 303, 320 |
| — suppression of, during pregnancy ... | 1. 78, 155 | — kinds of, suitable for infant | 1. 326 |
| — uterine mucosa during | 11. 49, 61 | — leg, <i>cf.</i> Phlegmasia alba. | |
| Mental activity in new-born child ... | 1. 315 | — normal quantity of | 1. 301 |
| — disorders, <i>cf.</i> Insanity | | — quantity of, affected by diet | 1. 305 |
| Mercurial ointment for indurations ... | 11. 411 | — sacculi | 1. 56 |
| — ointment for sore nipple | 11. 403 | — secretion of, <i>cf.</i> Mammary secretion. | |
| Mercury, <i>cf.</i> also Calomel. | | — sugar, amount of, in milk | 1. 304 |
| Mercury in syphilis | 1. 365, 366 | — supply, deficient, treatment | 1. 320, 323 |
| Mesentery of internal generative organs | 1. 38 | — supply, excessive | 1. 320, 323, 11. 399 |
| Mesoblast | 1. 90 | — Swiss, for infant | 1. 331 |
| Mesoderm | 1. 90 | — tumour, <i>cf.</i> Galactocele | 11. 411 |
| Mesogastrium, contents of | 1. 7 | — "witches" | 1. 312 |
| Metabolism during pregnancy | 1. 78 | Minute structure of generative organs ... | 1. 45 |
| — in fetus | 1. 133 | Miscarriage, <i>cf.</i> Abortion and Pre-mature labour. | |
| — in fetus, bibliography | 1. 139 | Missed labour | 1. 501 |
| Meteorismus in puerperal fever | 11. 412 | Mobility of fetal head | 1. 126 |
| — treatment | 11. 475 | — — pelvic joints, abnormal | 1. 414 |
| Metritis after delivery | 11. 376 | — — pelvic joints, bibliography | 1. 415 |
| — causing stricture of uterus | 11. 247 | — — pelvic joints, <i>cf.</i> also Articulations. | |
| — during pregnancy | 1. 408 | — — uterus with contracted pelvis | 11. 50 |
| Metro-lymphangitis | 11. 438 | Mola sanguinea | 1. 445, 450 |
| — phlebitis | 11. 439 | Molar pregnancy causing hemorrhage ... | 1. 456 |
| Metroscope | 1. 148 | — — diagnosis of | 1. 457 |
| Meyer on inclination of pelvis | 1. 17 | — — extra-uterine | 1. 455 |
| Michaelis on danger caused by pelvic contraction | 11. 66 | — — recurrence of | 1. 455 |
| — on pelvic contraction | 11. 28 | — — signs of | 1. 456 |
| Micrococci in puerperal fever | 11. 426, 427, 438, 447 | — — treatment of | 1. 457 |
| Micro-organisms, <i>cf.</i> also Bacteria | | Mole | 1. 273, 448 |
| Micro-organisms in puerperal fever ... | 11. 426, 427, 437 | — cystic, <i>cf.</i> Mole, vesicular. | |
| — in suppuration | 11. 423, 437 | — figure of | 1. 450 |
| Micturition, <i>cf.</i> also Urine. | | — figure of cystic | 1. 452 |
| — difficulty of, after delivery | 1. 319, 11. 393 | — giving rise to polypus | 1. 451 |
| — during pregnancy | 1. 87, 345, 389 | — hydatiform, <i>cf.</i> Mole, vesicular. | |
| Midwifery definition of | 1. 1 | — pigmentation of | 1. 450 |
| — thorough knowledge of, necessary ... | 1. 251 | — varieties of | 1. 450 |
| Migration of ovum | 1. 63, 372, 419, 420 | — vesicular | 1. 451, 452 |
| — of ovum, extra-uterine | 1. 372, 420 | — vesicular, bibliography | 1. 504 |
| — of ovum, intra-uterine | 1. 420 | Mons Veneris | 1. 87 |
| — of semen | 1. 372 | Monsters, acanthæ | 11. 176 |
| Malaria in fetus | 1. 119, 121 | — accephalic | 11. 177 |
| Milk affected by drugs | 1. 305 | — anencephalic | 11. 176 |
| — bibliography | 1. 308, 333 | — bibliography | 11. 203 |
| — composition of | 1. 304 | — causing dystocia | 11. 172 |
| | | — diagnosis | 11. 173, 174 |
| | | — double | 11. 174 |
| | | — double, bibliography | 11. 203 |
| | | — excretion of | 11. 171 |
| | | — headless | 11. 174 |

- | | PAGE | | PAGE |
|---|----------------------------|--|------------------|
| Monsters, hemicephalic ... | 11. 176 | Mucous membrane of ovary ... | 1. 53 |
| — management of labour with ... | 11. 174 | — of uterus ... | 1. 49, 67 |
| — mode of presentation ... | 11. 173, 174 | — uterus, after delivery ... | 1. 295 |
| — mutilation of ... | 11. 175 | — uterus, at time of labour ... | 1. 293 |
| — myelacephalic ... | 11. 176 | — uterus, during menses ... | 1. 19, 61 |
| — varieties of ... | 11. 172 | — uterus, reconstruction of ... | 1. 295 |
| Monstrosities, <i>cf.</i> Monsters ... | 11. 172 | — vagina ... | 1. 47, 77 |
| Montgomery, glands of ... | 1. 57, 80 | — vulva ... | 1. 46, 77 |
| Monthly courses, <i>cf.</i> Menstruation ... | 1. 507 | Müller, ring of ... | 1. 75 |
| Morbidity of puerperal state ... | 11. 432, 460, 465 | Multipara, uterus of ... | 1. 32 |
| Moribund woman, artificial prema-
ture labour in ... | 1. 369 | Multiple exostoses in pelvis ... | 11. 128 |
| — — Caesarian section on ... | 1. 368, 11. 611, 612 | — foetuses causing inertia ... | 11. 5 |
| Morning sickness during pregnancy ... | 1. 86 | — fractures due to rickets ... | 1. 190 |
| — — excessive ... | 1. 341, 350 | — pregnancy ... | 1. 270 |
| — — treatment ... | 1. 343 | — — acardia in ... | 1. 275 |
| Morphia, <i>cf.</i> also Opium, Narcotics. | | — — bibliography ... | 1. 286 |
| — during labour ... | 1. 255, 269 | — — development of foetuses ... | 1. 273 |
| — during version ... | 11. 192, 525 | — — diagnosis of ... | 1. 277 |
| — for stricture of uterus ... | 11. 248 | — — foetus papyraceus in ... | 1. 275 |
| — for uterine inertia ... | 11. 8 | — — frequency of ... | 1. 270 |
| — for uterine rheumatism ... | 1. 409 | — — hemorrhage after ... | 1. 285 |
| — in chorea ... | 1. 349 | — — interlocking of foetuses ... | 1. 282, 283 |
| — in eclampsia ... | 11. 219, 221 | — — management of ... | 1. 281, 284 |
| — in insanity ... | 11. 419 | — — mummification of foetus in ... | 1. 275 |
| — in precipitate labour ... | 11. 17 | — — number of foetuses ... | 1. 270 |
| — in spasmodic strictures ... | 11. 24 | — — presentation in ... | 1. 281 |
| — in version ... | 11. 192, 525 | — — prognosis in ... | 1. 284 |
| — injection of, into foetal sac ... | 1. 141 | — — sex of foetuses in ... | 1. 271 |
| Mortality of puerperal state ... | 11. 420, 432, 465 | — — treatment ... | 1. 281, 284 |
| — puerperal, affected by operations ... | 11. 2 | — — weight of foetuses in ... | 1. 274 |
| Mortise and tenon lock ... | 11. 559 | Mummification of foetus ... | 1. 275, 434, 500 |
| Mother, care of, <i>cf.</i> Puerperal state. | | — of foetus, causes ... | 1. 501 |
| Mother, syphilis in ... | 1. 145, 364 | Murphy, repositior of ... | 11. 342 |
| Motile centre for uterus ... | 1. 172, 174 | Muscle, development of, in foetus ... | 1. 118 |
| Motility of foetal head ... | 1. 126 | — plates ... | 1. 90 |
| Moulding of head disappears after
delivery ... | 1. 340 | Muscles, abdominal, <i>cf.</i> Abdominal. | |
| — — during delivery ... | 1. 202 | — affected in puerperal fever ... | 11. 449 |
| — — in brow presentations ... | 1. 234 | — brachial, of infant ... | 1. 137 |
| — — in face presentations ... | 1. 227 | — injury to, during extraction ... | 11. 546 |
| — — in occipito-posterior
positions ... | 1. 217 | — psoas, <i>cf.</i> Psoas. | |
| — — in vertex presentations ... | 1. 213 | — recti, <i>cf.</i> Recti. | |
| — — with flat pelvis ... | 11. 69 | Muscular action causing deformity in
rickets ... | 11. 47 |
| — — with generally contracted
pelvis ... | 11. 71 | — development of arms of foetus ... | 1. 137 |
| Mouth, development of ... | 1. 118 | — fibres of uterus, growth during
pregnancy ... | 1. 67 |
| injuries to, during labour ... | 11. 539, 547 | — — involution of ... | 1. 292 |
| Movements, earliest foetal ... | 1. 118 | — — position altered by pains ... | 1. 192 |
| foetal ... | 1. 118, 130, 143, 153, 154 | — — — reconstruction of, in
fresh pregnancy ... | 1. 67 |
| — foetal, cessation of ... | 1. 165 | Muscular tone in asphyxia ... | 11. 365, 366 |
| — foetal, during labour ... | 1. 181, 182 | Muscularis of uterus ... | 1. 48, 67, 69 |
| — foetal, when first felt ... | 1. 159 | Musculature, uterine, capacity for
work ... | 1. 191, 11. 67 |
| — of coccyx ... | 1. 13 | — — degeneration of ... | 1. 292, 11. 5 |
| — treading, in pelvic presenta-
tions ... | 1. 237 | — — imperfect development of ... | 11. 5 |
| Mucosa, <i>cf.</i> Mucous membrane. | | Musk in treatment of asphyxia ... | 11. 355 |
| Mucous membrane of cervix ... | 1. 50, 75 | — in treatment of hemorrhage ... | 11. 242 |
| — — of Fallopian tubes ... | 1. 52 | Mutilation of foetus ... | 11. 579, 601 |
| | | — of foetus, bibliography ... | 11. 696 |
| | | — of foetus, <i>cf.</i> also Perforation,
Embryotomy. | |

- | | PAGE | | PAGE |
|--|----------------------------|---|-------------------|
| Mylacephali | 11. 176 | Nauche, kiestine of | 1. 87 |
| Myoma causing hæmorrhage ... | 11. 144 | Nausea during pregnancy ... | 1. 86, 341, 343 |
| — causing inertia | 11. 5 | Nauseants in uterine spasm ... | 11. 20 |
| — causing inversion | 11. 144 | Navel, <i>cf.</i> Umbilicus. | |
| — causing placenta prævia ... | 11. 144 | Neck, division of fetal | 11. 502, 503 |
| — causing rupture | 11. 144 | — emphysema of | 11. 19 |
| — cervical | 11. 143, 145 | — injury to, during extraction ... | 11. 539, 546 |
| — corporeal | 11. 143 | — traction on, in delivering head ... | 11. 547, 548 |
| — expulsion of, simulating abortion ... | 11. 519 | Nægele, <i>cf.</i> Nægele. | |
| — intra-vaginal | 11. 145 | Negro pelvis | 1. 23 |
| — mistaken for foetus | 1. 154 | Nephritis, <i>cf.</i> also Kidneys, <i>Adm.</i> | |
| — obstructing delivery | 11. 143, 147 | — micturition. | |
| — subserous | 11. 145 | — during pregnancy | 1. 346, 349 |
| — subserous, figure | 11. 146 | — in eclampsia | 11. 211, 213 |
| — uterine, bibliography | 11. 159 | — in puerperal fever | 11. 146 |
| — — <i>cf.</i> also Fibroid. | | — necessitating abortion | 11. 702 |
| — — complicating pregnancy ... | 1. 398 | Nerve, affections of obturator ... | 11. 397 |
| — — effect on pains | 11. 144 | — affections of sciatic | 11. 397 |
| — — necessitating abortion | 11. 502 | — sciatic, in eclampsia | 11. 217 |
| Myrtiform caruncles | 1. 48, 163 | — vagus, irritation of | 11. 357, 358, 360 |
| Myxoma, diffuse, of fetal membranes ... | 1. 458 | Nerves, injury to, during delivery ... | 11. 391 |
| — fibrous placentic | 1. 471 | — of uterus | 1. 54, 172 |
| — of chorion | 1. 451 | — paralysis of accelerator | 11. 357 |
| — of chorion, bibliography | 1. 504 | Nervous disorders, <i>cf.</i> Insanity. | |
| | | Chorea, Neuroses. | |
| N. | | — system, development of | 1. 96 |
| Nabothian follicles | 1. 50 | — system during pregnancy | 1. 88 |
| Nægele's obliquity | 1. 198, 210, 218, 224, 238 | Nestlé's milk food for infant ... | 1. 331 |
| — — bibliography | 1. 250 | Neuralgia during pregnancy ... | 1. 88 |
| — — in breech presentations ... | 1. 238 | — of limbs after delivery | 11. 396 |
| — — with flat pelvis | 11. 68 | — of uterus | 11. 376 |
| — — with generally contracted flat pelvis ... | 11. 72 | Neuritis | 11. 391 |
| — — with generally contracted pelvis | 11. 70, 71 | Neuroses during pregnancy | 1. 341 |
| Nægele on duration of pregnancy ... | 1. 161 | — of bladder | 11. 393 |
| — pelvis | 11. 93 | New-born child | 1. 366 |
| — — ætiology | 11. 96 | — — activity of senses in | 1. 343 |
| — — diagnosis of | 11. 101 | — — albuminuria in | 1. 311 |
| — — figure of | 11. 94 | — — alteration in circulation ... | 1. 309, 310 |
| — — labour in | 11. 103, 104 | — — apnoea of | 1. 133, 11. 364 |
| — — measurements | 11. 102 | — — application to breast | 1. 321, 322 |
| — — scissors of | 11. 586 | — — artificial feeding of | 1. 325 |
| Narcosis, <i>cf.</i> also Anæsthesia, Morphia, &c. | | — — asphyxia of | 11. 356 |
| — during labour | 1. 255, 267, 269 | — — bed for | 1. 342 |
| — during version | 11. 192, 513, 518 | — — best food for | 1. 311, 320 |
| Narcotics for abnormal pains, bibliography ... | 11. 25 | — — bibliography | 1. 310 |
| — in chorea | 1. 349 | — — breasts of | 1. 311 |
| — — eclampsia | 11. 219, 220, 221, 225 | — — breasts of, bibliography ... | 1. 310 |
| — — insanity | 11. 419 | — — caput succedaneum, <i>cf.</i> Caput | |
| — — stricture of os | 11. 23 | — — care of | 1. 325 |
| — — tetanus | 11. 483 | — — changes in skin | 1. 312, 313 |
| — — uterine inertia | 11. 8 | — — chorea in | 1. 348 |
| — — uterine spasm | 11. 20 | — — circulation in | 1. 306 |
| Narrowness of hips in pelvic contraction ... | 11. 30 | — — clothing of | 1. 323 |
| Naso-frontal fontanelle | 1. 125 | — — colic in | 1. 327 |
| Nates, flagellation of, in asphyxia ... | 11. 367 | — — colostrumlike secretion of ... | 1. 311 |
| | | — — continued apnoea of | 1. 308, 11. 364 |
| | | — — convulsions of | 1. 341 |
| | | — — desquamation in | 1. 312, 313 |
| | | — — diarrhoea of | 1. 328 |
| | | — — digestive processes in | 1. 311, 316 |

- | | PAGE | | PAGE |
|---|---------------------------|--|----------------------------|
| New-born child, feces of | 1. 311, 328, 331 | Noose | 1. 252 |
| — first respiration of | 1. 262, 308 | — cf. also Fillet. | |
| — food for | 1. 311, 328 | — use of, during version | 11. 524, 525, 527, 531 |
| — gain of weight by | 1. 315, 330 | Normal conjugate | 1. 17 |
| — hand feeding of | 1. 328 | Nose, development of | 1. 118 |
| — hypertrophy of left ventricle | 1. 310 | Nuchal displacement of arm | 11. 197 |
| — icterus of | 1. 312, 313 | Nuck, canal of | 1. 38 |
| — icterus of, bibliography | 1. 316 | Nullipare, uterus of | 1. 32 |
| — importance of cleanliness | 1. 326 | Nulliparity, signs of | 1. 162 |
| — intertrigo in | 1. 312, 326 | Nurse, selection of wet | 1. 327 |
| — loss of weight by | 1. 314 | Nursing, cf. also Suckling. | |
| — mammary glands of | 1. 312 | — counter-indications to | 1. 321, 11. 400, 402, 411 |
| — — — bibliography | 1. 316 | — mother, diet of | 1. 305, 320, 323 |
| — management of | 1. 325 | — of new-born child, cf. Suckling. | |
| — mental activity of | 1. 315, 316 | — regularity of, desirable... | 1. 322 |
| — pelvis of | 1. 20 | Nutrition of fetus | 1. 132 |
| — power of vision in | 1. 315 | Nux vomica for weakness of bladder | 11. 395 |
| — production of heat in | 1. 314 | — — in uncontrollable vomiting | 1. 343 |
| — puerperal infection of | 11. 476, 482 | Nyctalopia during pregnancy | 1. 349 |
| — renal secretion in | 1. 311, 316 | Nymphæ | 1. 30, 45 |
| — separation from mother | 1. 262, 263 | — injured by forceps | 11. 570 |
| — septic infection of | 11. 476 | — puerperal involution of | 1. 297 |
| — — — bibliography | 11. 482 | | |
| — signs of health of | 1. 328, 330 | O. | |
| — suckling of, a duty | 1. 320 | Object of midwifery | 1. 1 |
| — sudamina of... | 1. 312 | Oblique contraction of pelvis | 11. 27, 93 |
| — tactile sensations in | 1. 315 | — diameter of brim | 1. 12 |
| — temperature of | 1. 314 | — external diameters | 11. 36 |
| — trismus in | 1. 325 | — lie of fetus | 1. 205, 11. 178 |
| — urine of | 1. 311 | — pelvis, cf. Obliquely contracted pelvis. | |
| — urine of, bibliography | 1. 316 | — presentation of fetus | 1. 205, 11. 178 |
| — various foods for | 1. 328 | — surfaces of pelvis | 1. 19, 200, 243 |
| — voiding in | 1. 315 | Obliquely contracted pelvis | 11. 93 |
| — weight of | 1. 122, 314, 316 | — — — etiology | 11. 96 |
| Nipple | 1. 56 | — — — bibliography | 11. 132 |
| — cracked | 1. 322, 324, 11. 401, 402 | — — — diagnosis | 11. 101 |
| — cracked, bibliography | 1. 333, 11. 412 | — — — figure of | 11. 94 |
| — depressed, treatment of | 1. 169, 170, 320 | — — — labour in | 11. 103 |
| — eczema of | 11. 401, 403 | — — — measurements | 11. 102 |
| — effect of pregnancy on | 1. 79 | — — — treatment | 11. 104 |
| — erosion of | 11. 401 | — distorted pelvis | 11. 93, 95 |
| — excessive sensitiveness of | 1. 169 | Obliquity, bilateral, cf. Obliquity, Nægele's. | |
| — fissure of | 11. 401, 402 | — biparietal, cf. Obliquity, Nægele's. | |
| — irritability during pregnancy | 1. 157, 169 | — Nægele's | 1. 198, 210, 218, 224, 238 |
| — irritation of, as oxytocic | 11. 14 | — — — bibliography | 1. 250 |
| — management of, during pregnancy | 1. 160 | — — in flat pelvis | 11. 68 |
| — management of, during suckling | 1. 322 | — — in generally contracted flat pelvis | 11. 72 |
| — shield | 1. 321, 11. 402, 403 | — — — — pelvis | 11. 70, 71 |
| — sore | 1. 322, 324, 11. 401, 402 | — of fetal head, lateral | 1. 210 |
| — sore, treatment | 1. 324, 402 | — — — (Nægele's) | 1. 198, 210, 218, 224, 238 |
| — ulceration of | 11. 401, 402 | — — — — permanent | 1. 214 |
| Nixus, menstrual | 1. 60, 171 | — — — — Roesler's | 1. 211 |
| Nitrite of amyl in tetanus | 11. 483 | — — — — Solayres' | 1. 210 |
| Nitrous oxide and oxygen in Caesarian section | 11. 614 | Obliteration of cervix | 1. 179, 194 |
| Nodules, fibrous, of placenta | 1. 468 | — — — cf. also Canalisation. | |
| — syphilitic, in bone | 1. 494 | — — — fetal blood channels | 1. 309 |
| — — in intestine | 1. 494 | — — — — bibliography | 1. 316 |
| — — in liver | 1. 493 | | |
| — — in lungs | 1. 492 | | |
| — — in supra-renals | 1. 494 | | |

	PAGE		PAGE
Ossification delayed, causing flat pelvis	11, 45	Ovary, effect of menstruation on	1, 60
— of foetal, commencement of	1, 117, 120	— epithelium of	1, 52, 53
— of astragalus	1, 120	— follicles of	1, 52, 54
— of femur	1, 121, 122	— germinal epithelium	1, 52
— of os calcis	1, 120	— ligament of	1, 34
Osteo-chondritis	1, 494, 496	— prolapse of cystic	11, 154
— syphilitica	11, 163	— so-called tunica albuginea of	1, 53, 59
Osteo-genesis imperfecta	1, 489	— stroma	1, 53
Osteo-malacia	11, 112	— structure of	1, 52, 54
— causing rupture of pelvis	11, 323	— tunica propria of	1, 60
— causing softening of bones	11, 116	Oviduct, <i>cf.</i> Fallopian tube.	
— mortality due to	11, 118	Ovula Nabothi	1, 50
— varieties	11, 113	Ovulation	1, 60
Osteo-malacic pelvis	11, 112	— cessation of, during pregnancy	1, 276
— bibliography	11, 133	Ovum	1, 64, 65, 96, 116
— characters of	11, 114	— aborted	1, 448
— diagnosis	11, 116	— at different months of preg-	
— figures of	11, 115	— nancy	1, 115
— treatment	11, 118	— <i>cf.</i> also Embryo, Fetus.	
Osteo-mylitis	11, 112	— detachment of, causing hemor-	
Osteophytes	1, 85, 494	— rhage	1, 506
— bibliography	1, 90, 494	— development	1, 90, 115
Ostitis causing osteo-malacia	11, 112	— development in extra-uterine	
— parenchymatosa chronica	1, 489	— pregnancy	1, 421
Outlet of pelvis	1, 11, 13, 14, 25	— discharge of, from ovary	1, 60, 63, 64
— inclination	1, 16	— diseases of	1, 418, 505
— measurement	1, 13, 11, 40	— ectoderm of	1, 90
— transverse diameter	11, 40	— effect on dilatation of os	1, 74, 192
— variation in size	1, 13	— embryonic area of	1, 90
Ova	1, 53, 54	— endoderm of	1, 90
— maturity of	1, 59	— expulsion of, in abortion	1, 519
Ovarian arteries in uterine hemor-		— fertilisation of, in ovary	1, 419
— rhage	11, 240	— figures of early	1, 91, 92, 94
— <i>cf.</i> also Ovary.		— fecundation of	1, 63
Ovarian cyst, bibliography	1, 418, 11, 159	— forceps	1, 526
— <i>cf.</i> also Ovarian tumour.		— germinal spot of	1, 54
— complicating pregnancy	1, 398,	— mesoderm of	1, 90, 91
403, 418, 11, 152		— migration of	1, 63, 372, 419
— confused with hydramnios	1, 464	— puncture of, in hernia	1, 383
— mistaken for fetus	1, 154	— in retroversion of uterus	1, 395
— removal of, during pregnancy	1, 407	— retention of dead	1, 501
— rupture of	1, 405	— segmentation of	1, 90
— tapping of	1, 406, 11, 153	— vitellus of	1, 54, 90
Ovarian pregnancy	1, 419, 429	— with two germs	1, 271
— pregnancy, bibliography	1, 504	— zona pellucida of	1, 54
— tumour, <i>cf.</i> also Ovarian cyst.		Oxalate of cerium in uncontrollable	
— effect on delivery	11, 152	— vomiting	1, 343
— puncture of, during labour	11, 153	Oxygen consumed by fetus	1, 134
— removal of, during preg-		Oxytocics	11, 9, 11, 13
— nancy	1, 407	— <i>cf.</i> also Ergot, Cannabis indica, &c.	
— tapping of	1, 406, 11, 153	— counter-indications to use of	11, 12
— treatment during labour	11, 153	— in abortion	1, 522, 523
Ovaries affected in puerperal fever	11, 441	— indications for	1, 522, 11, 9, 10, 11
— anatomy of	1, 34, 52, 53, 59	— physiological action of	11, 11, 12
— extirpation of	11, 622		
— maturity of	1, 59		
Ovariectomy during labour	11, 154		
— during pregnancy	1, 407		
Ovary	1, 34		
— bibliography of	1, 57		
— bulb of	1, 53, 59		
— during pregnancy	1, 78		

P.

Pack, wet, bibliography	11, 471
— in eclampsia	11, 222
— in high fever	11, 471
— in puerperal fever	11, 471

- Pain**, degree of, accompanying labour I. 176, 177, 183
- Pains**, action of, on uterus and placenta I. 189, 202
- after ... I. 292, 298, 319, II. 375
 - anomalies of the ... II. 3, 4, 5
 - causing great suffering, treatment ... II. 8
 - *cf.* also Contractions, uterine
 - characters of the ... I. 175, 189
 - condition of, in pelvic contraction II. 65
 - effect of chloroform on ... I. 266, 267
 - effect of pelvic contraction on II. 58, 65
 - effect on fetal pulse ... I. 147
 - how affected by obstruction ... II. 3
 - in breasts during pregnancy ... I. 79
 - psychical influence on ... II. 5
 - relation of, to eclamptic fit ... II. 208
 - spasmodic ... II. 26
 - sympathetic, during labour ... I. 177
 - too feeble ... II. 5
 - too strong ... II. 16
- Pajot** on cephalotripsy ... II. 593
- trephine of ... II. 587
- Palfyn**, forceps of ... II. 554
- Palmar plicata** ... I. 50
- Palpation** of abdomen ... I. 141
- of pelvis ... II. 37
- Palpitation** during pregnancy ... I. 85
- Pampiniform plexus** ... I. 51
- Pancreas**, syphilitic changes in I. 491, 493
- Panniculus adiposus** ... I. 123
- Panophthalmitis** in puerperal fever II. 448
- Papilla**, vaginal ... I. 47, 77
- Papillomata** of cervix ... II. 150
- Papyraceous foetus** ... I. 275
- foetus, bibliography ... I. 284
- Paracystitis** ... II. 390, 392
- Paralysis** due to labour ... II. 322, 396
- due to labour, bibliography ... II. 399
 - of bladder, after delivery ... II. 395
 - of facial nerve ... II. 565, 566
 - of Landouzy ... II. 566
 - of limbs after delivery ... II. 322, 396
 - of uterine muscle ... II. 22
 - traumatic ... II. 398
- Parametritis** ... II. 404
- Parametric abscess** ... II. 456
- connective tissue ... I. 45, 78
 - indurations after delivery ... II. 397
- Parametritis** after abortion ... I. 517
- after injury to vagina ... II. 301
 - after rupture of uterus ... II. 289, 296
 - caused by pelvic contraction ... II. 79
 - during pregnancy ... I. 408
 - in puerperal fever II. 436, 439, 453, 455
 - phlegmonous lymphatics ... II. 440
 - treatment ... II. 474
- Parametrium** ... I. 38, 43
- Parasitic tumours** causing dystocia II. 170
- Parchmentlike crackling** of cranial bones ... I. 207
- Parenchyma**, changes in uterine ... II. 1
- Paresis**, *cf.* Paralysis
- Parietal bone**, fracture of, in pelvis
- contraction ... II. 76, 77
 - bone, presentation of anterior II. 73, 80
 - bone, presentation of posterior II. 75, 80
 - bones displaced during labour ... I. 210
- Parity**, post-mortem diagnosis of ... I. 509
- Parospheron** ... I. 51
- Parotid** affected in puerperal fever ... II. 141
- Parovarium** ... I. 34, 37, 51
- Parow** on inclination of pelvis ... I. 47
- Parturient canal** ... I. 24
- atresia of ... II. 136
 - bibliography ... I. 4
 - canalisation of ... I. 17
 - canalisation of, *cf.* also Canalisation
 - dilatation of ... I. 17
 - dilatation of, *cf.* also Dilatation
 - disinfection of ... I. 272, 273, 274
 - figure ... I. 2
 - inflammation of, during labour II. 1
 - lacerations of ... II. 270, 271
 - perforations of ... II. 270, 271, 272
 - rigidity of ... II. 133
 - ruptures of ... II. 270, 271
- Parturition** ... I. 173
- bibliography of ... I. 249
 - *cf.* also Labour
 - chloral during ... I. 26
 - chloroform during ... I. 26
 - clinical progress of ... I. 173
 - date of, how predicted ... I. 153
 - deferred ... I. 16
 - determining cause of ... I. 173
 - diagnosis of recent ... I. 190
 - duration of ... I. 159
 - several periods of ... I. 153
 - with face presentation ... I. 22
 - dynamics of ... I. 153
 - dynamics of, bibliography ... I. 249
 - effect on anus ... I. 182, 183
 - intra-abdominal pressure ... I. 173
 - perineum ... I. 16
 - shape of head ... I. 21
 - weight of woman ... I. 183
 - followed by exhaustion ... I. 183
 - hæmorrhage during ... I. 15
 - insanity during ... I. 41
 - irrigations during ... I. 253
 - literature of ... I. 249
 - management of ... I. 253
 - mania during ... I. 41
 - mechanism of ... I. 190
 - mechanism of, bibliography ... I. 253
 - morphia during ... I. 263
 - pathology of ... I. 539, 193
 - periods of ... I. 173
 - posture during ... I. 23
 - precipitate ... II. 1
 - precipitate, *cf.* also Precipitate

	PAGE		PAGE
Parturition, premonitory signs of ...	I. 171	Pelvic outlet ...	I. 13, 14, 18, 25
— signs of ...	I. 171	— outlet, measurement of ...	II. 40
— stages of ...	I. 179	— outlet, soft parts of ...	I. 25
— support of perineum during ...	I. 258	Pelvic presentations, causes of ...	I. 236
— time of commencement of ...	I. 187	— — danger of asphyxia in ...	I. 245
— time of termination of ...	I. 187	— — diagnosis of ...	I. 207, 237
— uterine mucosa after ...	I. 293	— — frequency of ...	I. 205, 236
— with pelvic contraction ...	II. 58	— — in a contracted pelvis ...	II. 75, 90
— with procidentia uteri ...	I. 177	— — in a flat pelvis ...	II. 75
— with quadruplets ...	I. 286	— — in a generally contracted, flat pelvis ...	II. 76
— with triplets ...	I. 286	— — prognosis of ...	I. 244
— with twins ...	I. 270	— — super-rotations in, <i>cf.</i> Super-rotations ...	I. 244
Pathology of labour ...	II. 1	— — treatment of ...	I. 246
— of pregnancy ...	I. 336	— tumours ...	II. 143
— of puerperal state ...	II. 374	— tumours, bibliography ...	II. 159
Pectus carinatum in rickets ...	I. 488	— version, <i>cf.</i> Version.	
Pelvic of ovarian cyst, injury to, during labour ...	II. 152	Pelvimeter, van Huevel's ...	II. 37
— of ovarian cyst, twisting of ...	I. 407	Pelvimeters ...	II. 37
Pedunculated hæmatoma ...	II. 321	Pelvimetry ...	II. 29, 31, 32, 36
Peeling off the placenta ...	II. 256	— bibliography ...	II. 132
Pelvic articulations, <i>cf.</i> Articulations.		— external measurements ...	I. 9, 11, 32
— bandage for injury to joints ...	II. 325, 326	— internal measurements ...	I. 12, 11, 36
— bones, softening of, in osteomalacia ...	II. 113, 116	Pelviotomy ...	II. 623
— contraction, absolute ...	II. 62	Pelvis ...	I. 7
— — Casarian section in ...	II. 89, 610	— abnormal inclination of ...	II. 26
— — causing fissures of skull ...	II. 81	— adult, development of ...	I. 19
— — causing inertia ...	II. 65	— — æqualiter justo major ...	II. 26
— — causing marks on head ...	II. 80, 81	— — æqualiter justo minor ...	II. 27
— — causing rupture of genital canal ...	II. 78	— affected by dislocation of femur ...	II. 98, 99, 127
— — causing rupture of occipital bone ...	II. 82	— affected by fracture of femur ...	II. 98
— — causing rupture of sutures ...	II. 81	— articulations of, <i>cf.</i> Articulations.	
— — causing rupture of uterus ...	II. 64	— asymmetry of, due to dislocation of femur ...	II. 127
— — cephalothrypter in ...	II. 89	— atrophy of, due to dislocation of femur ...	II. 126
— — cranioclast in ...	II. 84, 89	— axis of ...	I. 18
— — dangers caused by ...	II. 66	— bibliography of ...	I. 24, 37
— — effect on bag of membranes ...	II. 62	— bones of ...	I. 7
— — effect on cervix ...	II. 65	— brim of, <i>cf.</i> Inlet ...	I. 8, 12
— — effect on pains ...	II. 65	— canal of, soft parts ...	I. 25
— — followed by parametritis ...	II. 79	Pelvis caoutchouc ...	II. 113
— — followed by phlegmon ...	II. 79	— cavity of ...	I. 11
— — forceps in ...	II. 84, 85, 564	— cavity of, peritoneal ...	I. 43
— — induction of abortion in ...	II. 91, 502	— cavity of, subcutaneous ...	I. 43
— — mechanism of labour with ...	II. 67	— cavity of, subperitoneal ...	I. 43
— — mortality of children ...	II. 82	— characters of infantile ...	I. 20
— — mortality of mothers ...	II. 82	— circumference of ...	II. 35
— — necessitating premature labour ...	II. 91, 489, 490	— conjugates of, <i>cf.</i> Conjugata.	
— — — pedalic version in ...	II. 87, 517	— connective tissue of ...	I. 38, 43, 78
— — — prognosis in cases of ...	II. 77	— contracted ...	II. 26, 41
— — — rare forms of ...	II. 91	— — and Casarian section ...	II. 62, 610
— — — relative ...	II. 83	— — bibliography ...	II. 131
— — — sequelæ for child ...	II. 79	— — causing delay in delivery ...	II. 61
— — — sequelæ for mother ...	II. 77	— — — increased mobility of uterus ...	II. 59
— — — treatment ...	II. 82	— — — rupture ...	II. 273, 277, 323
— — — various degrees of ...	II. 61	— — — transverse presentation ...	II. 59, 180
Pelvic girdle ...	II. 325, 326	— — — diagnosis ...	II. 29, 41, 491
— lie ...	I. 181, 204, 205	— — effect on child ...	II. 66, 79
— measurements, <i>cf.</i> Pelvimetry, Conjugata, <i>cf.</i>		— — effect on mother ...	II. 66, 77

	PAGE		PAGE
Pelvis, contracted, effect on parturi-		Pelvis, funnel-shaped, <i>cf.</i> Pelvis, in-	
tion	11. 58	fundibuliform.	
— frequency	11. 29	Pelvis, generally contracted ...	11. 27, 51
— influence during pregnancy	11. 58	— — and flat	11. 55
— — on attitude of fetus ...	11. 59	— — and flat, diagram ...	11. 55, 57
— — on factors of labour ...	11. 58	— — bibliography	11. 132
— — on position of fetus ...	11. 58	— — causes	11. 53
— — on presentation of fetus ...	11. 58	— — characters of	11. 52
— infundibuliform	11. 91	— — diagnosis	11. 54
— infundibuliform, ætiology ...	11. 92	— — diagram	11. 43, 52
— labour in	11. 58	— — measurements	11. 34, 54
— varieties of	11. 27, 41, 91	— — mechanism of labour with	11. 70
— deformities of	11. 25	— great	1. 8
— deformities of, bibliography ...	11. 131	— — definition	1. 8
— deformity of, due to dislocation		— depth	1. 9
of femur	11. 124	— diameters	1. 9, 10, 32
— — due to exostoses	11. 128	— formation	1. 8
— — due to fracture	11. 129	— soft parts of	1. 24
— — due to osteo-malacia ...	11. 112, 119	— width	1. 9, 11, 32
— — due to rachitis	11. 43, 44, 46, 53, 56, 118	— imperfect development in rickets	11. 47
— — — due to spondylolisthesis ...	11. 119	— inclination of	1. 16, 18
— — — due to tumours	11. 128	— india-rubber	11. 117
— development of shape	1. 19	— infantile	1. 20
— diameters of, <i>cf.</i> Pelvimetry.		Pelvis, infundibuliform ...	1. 218, 11. 91
Conjugata.		— — bibliography	11. 132
— diaphragm of	1. 25	— — injuries caused by ...	11. 93
— differences in, due to age ...	1. 19, 20	— — inverted	11. 93
— differences in, due to race ...	1. 23	— — justo major	11. 26
— differences in, due to sex ...	1. 22	— — management of labour in ...	11. 92
— dilatation of	1. 12, 13	— injury to joints of	1. 415
— divisions of	1. 8	— injury to joints of, <i>cf.</i> also	
— dwarf	11. 52	Articulations.	
— dwarf, diagram of	11. 52	— inlet of, diameters	1. 12, 11
— effect of symphysectomy on ...	11. 324, 623	— inlet of, position	1. 8, 11
— excessive inclination of ...	11. 26	— inlet of, shape	1. 8
— exostoses of	11. 128	— insufficient inclination of ...	11. 26
— exostoses of, bibliography ...	11. 133	— inversa	11. 130
— external examination of ...	11. 32	— inverted infundibuliform ...	11. 95
— false	1. 8	— joints of, changes during preg-	
— fascin of	1. 26	nancy	1. 15, 78
— female	1. 22	— joints of, <i>cf.</i> also Articulations.	
— figures of normal	1. 8, 10, 11, 12	Pelvis, kyphotic	11. 105, 107
— fissured	11. 130, 133	— — bibliography	11. 132
Pelvis, flat	11. 27, 41, 45, 126, 131	— — diagnosis	11. 111
— — ætiology	11. 15, 126	— — difficulties of labour in ...	11. 111
— — caused by fissured symphysis	11. 131	— — figures of	11. 108, 111
— — description	11. 41	— — treatment	11. 112
— — diagnosis	11. 34, 46	— male	1. 22
— — diagrams of	11. 42, 44	— malformations of	11. 25
— — due to dislocation of femur ...	11. 126	— measurement of, <i>cf.</i> Conjugata.	
— — measurements of	11. 34, 44, 46	Pelvimetry	
— — mechanism of labour with ...	11. 75	— — bibliography	11. 132
— — mode of origin	11. 45	— — mode of development ...	1. 22
— — rickets	11. 46	— Nægele's	11. 98
— — rickets, diagnosis	11. 51	— Nægele's, <i>cf.</i> also Pelvis,	
— — rickets, diagram of	11. 43, 48	obliquely contracted.	
— — varieties of	11. 44	— Nægele's, figure	11. 94
— floor of	1. 25	Pelvis, obliquely contracted ...	11. 27, 93
— fractures of, causing deformity	11. 129	— — ætiology	11. 96
— funnel-shaped	1. 218	— — bibliography	11. 132
		— — diagnosis	11. 101
		— — figure	11. 94

	PAGE		PAGE
Pelvis, obliquely contracted, labour in	11. 103	Pelvis, tri-radiate rickety, figure	11. 119
— — — measurements	11. 102	— true	1. 8
— — — treatment	11. 104	— tumours of	11. 128
— — — distorted	11. 93	— tumours of, bibliography	11. 133
— obstructa	11. 110, 120	— undue mobility of joints of	1. 114
— obstructa, figure	11. 111	— undue narrowness of	11. 25
— osteo-malacic	11. 112	— undue width of	11. 25
— osteo-malacic, bibliography	11. 133	— unilateral contraction of	11. 93
— osteo-malacic, characters	11. 114	— unilateral contraction of, <i>cf.</i>	
— osteo-malacic, diagnosis	11. 116	Pelvis, obliquely contracted.	
— osteo-malacic, dilatability	11. 117	— variation in size...	1. 12
— osteo-malacic, figures	11. 115	Pemphigus syphilitica	1. 491
— outlet of	1. 11, 13, 14	Pendulosity, <i>cf.</i> Pendulous.	
— outlet of, inclination of	1. 18	Pendulous abdomen	1. 168, 219
— outlet of, variation in size	1. 13	— due to anteversion of uterus	1. 384
— palpation of	11. 37	— due to pelvic contraction	11. 59
— peritoneal lining of	1. 34	— in hydramnios	1. 463
— permanent widening of	11. 326	Pendulous uterus	1. 168, 384
— pseudo-osteo-malacic	11. 119	— due to pelvic contraction	11. 59, 65
— rachitic, <i>cf.</i> Rickety pelvis.		— treatment of	1. 168
— rickety, bibliography	11. 132	Pendulum movements	11. 534, 560, 561, 571
— rickety, <i>cf.</i> also Rickety pelvis.		— movements, bibliography	11. 578
— rickety flat	11. 44, 46, 49	Penis immisso without rupturing	
— Robert's	11. 105	hymen	11. 141
— aetiology	11. 106	— injury to, during extraction	11. 547
— diagnosis	11. 107	Pepsin in new-born child	1. 311
— figure	11. 105	Perchloride of iron as hæmostatic	11. 238,
— roofed in	11. 110, 120	246, 296, 309, 306	
— rupture of	11. 321	— — — <i>cf.</i> also Liquor ferri perchlor.	
— rupture of, bibliography	11. 327	— — — in placenta prævia	1. 549
— rupture of, causes	11. 323	Percussion of abdomen	1. 143
— rupture of, diagnosis	11. 324	Perforating ruptures of uterus	11. 271, 277
— rupture of, treatment	11. 326	Perforation	11. 579
— sexual differences in	1. 22	— best time for	11. 583, 585
— shape of	1. 8, 19	— bibliography	11. 600
— shape of brim	1. 14	— chloroform during	11. 585
— shape of brim in rickets	11. 50	— conditions for	11. 580, 585
— skeliotic rickety	11. 51	— continued life of child after	11. 590
— small	1. 8	— followed by extraction	11. 586, 590
— small, depth	1. 10	— followed by version	11. 590
— small, shape	1. 9	— in case of twins	1. 284
— small, walls	1. 9	— indications for	11. 580
— spinosa	11. 50, 129, 291, 292	— modus operandi	11. 586
— split	11. 130	— mortality after	11. 583, 597
— split, bibliography	11. 133	— of dead fetus	11. 580, 581
Pelvis, spondylolisthetic	11. 110, 119	— of living fetus	11. 589, 581, 582
— spondylolisthetic, aetiology	11. 123	— of membranes	11. 199
— spondylolisthetic, bibliography	11. 133	— of parturient canal	11. 79, 270
— spondylolisthetic, diagnosis	11. 123	— of uterus	11. 270, 271, 277
— spondylolisthetic, figures	11. 120, 121	— relation to extraction	11. 584
— spondylolisthetic, treatment	11. 124	Perforator. Blot's	11. 586
— squeezed in	11. 27	— cephalotribe, Cohen's	11. 598
— squeezed in, <i>cf.</i> Pelvis, tri-radiate.		— for membranes	11. 199
— strait of	1. 12, 13, 11. 40	— scissors	11. 586, 587, 588
— transverse contraction of	11. 105	— use of, in pelvic contraction	11. 84, 85,
— transverse contraction of, biblio-		86, 87	
— graphy	11. 132	Perforators	11. 586
— transversely contracted synostotic	11. 105	Pericarditis during pregnancy	1. 358
Pelvis, tri-radiate	11. 112	— in puerperal fever	11. 142
— tri-radiate, bibliography	11. 133	Pericystitis	11. 392
— tri-radiate rickety	11. 48, 118	Perimetritis	11. 442, 457
		— after abortion	1. 517

- | | PAGE |
|---|--------------------------------|
| Perimetritis after delivery | II. 376 |
| — during pregnancy | I. 408 |
| — treatment | II. 475 |
| Perineal bandage for prolapsed uterus I. 379 | |
| — canal | I. 198 |
| Perineorraphy | II. 142, 311, 312 |
| Perineum, ante-partum rupture of ... | II. 307 |
| — central rupture of | II. 307, 309, 314 |
| — during labour | I. 182, 183 |
| — fascia of | I. 26 |
| — in forceps extractions | II. 572 |
| — incisions into | I. 260 |
| — oedema of | II. 143 |
| — post-partum condition of | I. 306 |
| — posterior | I. 194 |
| — preservation of | I. 229, 248, 258, 260 |
| — preservation of, bibliography ... | I. 260 |
| — retraction of | I. 183, 260 |
| — rigid, obstructing labour | II. 142 |
| — rigid, treatment of | I. 260, II. 142 |
| — rupture of | I. 260, II. 306, 307, 311 |
| — — after precipitate labour | II. 18 |
| — — bibliography | I. 260, II. 327 |
| — — cf. also Rupture, perineal. | |
| — — diagram | II. 308 |
| — — frequency | II. 307 |
| — — prophylaxis | I. 229, 248, 258, 260, II. 311 |
| — — varieties | II. 307 |
| — size of | I. 25 |
| — support of | I. 238 |
| — — bibliography | I. 260 |
| — — cf. also Perineum, preservation of. | |
| — — during breech labours | I. 248 |
| — — in face presentations | I. 229 |
| — tumours of | II. 170 |
| — undue pressure upon | I. 229 |
| — undue rigidity of | I. 260, II. 142 |
| Period, lying-in, cf. Puerperal state. | |
| — of crowning | I. 182 |
| — — dilatation | I. 179 |
| — — dilatation, inertia during | II. 6 |
| — — dilatation, management of ... | I. 255 |
| — — expulsion | I. 179, 182 |
| — — expulsion, inertia during | II. 7 |
| — — expulsion, management of ... | I. 257 |
| — — the after-birth | I. 184 |
| — — the after-birth, bibliography ... | I. 316 |
| — — the after-birth, inertia during ... | II. 7, 9 |
| — — the after-birth, management ... | I. 263, 264, II. 235 |
| Period, placental | I. 184, 187 |
| — — cf. Period of the after-birth. | |
| — — inertia during the | II. 7 |
| — post-partum | I. 186, 316 |
| Periods, monthly, cf. Menstruation. | |
| Periphrisis after delivery | II. 387, 389 |
| — of umbilical vein | I. 480 |
| Peristaltic nature of uterine contractions | I. 175 |
| Peritoneum | I. 5, 34 |
| Peritoneum affected in rupture of uterus | II. 275, 277, 278, 280 |
| — pelvic | II. 275, 277, 278, 280 |
| — relation to abdomen | II. 275, 277, 278, 280 |
| — rupture of, during labour | II. 275, 277, 278, 280 |
| — slight elasticity of | II. 275, 277, 278, 280 |
| — toilette of | II. 275, 277, 278, 280 |
| Peritonitis | II. 275, 277, 278, 280 |
| — after Caesarian section | II. 275, 277, 278, 280 |
| — after rupture of uterus | II. 275, 277, 278, 280 |
| — cf. also Perimetritis. | |
| — due to syphilis | II. 275, 277, 278, 280 |
| — due to tubal pregnancy | II. 275, 277, 278, 280 |
| — in abdominal pregnancy | II. 275, 277, 278, 280 |
| — in puerperal fever | II. 275, 277, 278, 280 |
| — lymphatic | II. 275, 277, 278, 280 |
| — pelvic, cf. also Perimetritis ... | II. 275, 277, 278, 280 |
| — treatment | II. 275, 277, 278, 280 |
| Permanent drainage of uterus ... | II. 275, 277, 278, 280 |
| Permanganate of potash as disinfectant | II. 275, 277, 278, 280 |
| Pernicious anaemia during pregnancy | II. 275, 277, 278, 280 |
| Perspiration during labour | II. 275, 277, 278, 280 |
| Pessary for anteversion | II. 275, 277, 278, 280 |
| — for retroversion | II. 275, 277, 278, 280 |
| — lever | II. 275, 277, 278, 280 |
| — ring | II. 275, 277, 278, 280 |
| — Schultze's | II. 275, 277, 278, 280 |
| Phlebitis after delivery | II. 380, 420, 421 |
| — umbilical | II. 380, 420, 421 |
| Phlebotomy in eclampsia | II. 380, 420, 421 |
| Phlegmasia alba dolens | II. 380, 420, 421 |
| — alba dolens, bibliography | II. 380, 420, 421 |
| — alba dolens, causes | II. 380, 420, 421 |
| — alba dolens, treatment | II. 380, 420, 421 |
| Phlegmon during pregnancy | II. 380, 420, 421 |
| — in septicaemia | II. 380, 420, 421 |
| — of breast | II. 380, 420, 421 |
| — of thigh | II. 380, 420, 421 |
| — pelvic, diagnosis from puerperal fever | II. 380, 420, 421 |
| — pelvic, due to pelvic contraction ... | II. 380, 420, 421 |
| — pelvis traumatica | II. 380, 420, 421 |
| Phosphate of lime in hydræmia ... | II. 380, 420, 421 |
| Phosphorus poisoning | II. 380, 420, 421 |
| Plithisis during pregnancy | II. 380, 420, 421 |
| — effect on lying-in period | II. 380, 420, 421 |
| Physaliphorous cells | II. 380, 420, 421 |
| Physiological hæmorrhage | II. 380, 420, 421 |
| Physique accompanying rickets ... | II. 380, 420, 421 |
| Physometra | II. 380, 420, 421 |
| — bibliography | II. 380, 420, 421 |
| — treatment | II. 380, 420, 421 |
| Pigment, deposition of, on uterus ... | II. 380, 420, 421 |
| — disappearance of, post partum ... | II. 380, 420, 421 |
| Pigmentation during pregnancy ... | II. 380, 420, 421 |
| — of areola during pregnancy | II. 380, 420, 421 |
| — of mole | II. 380, 420, 421 |
| — of placenta | II. 380, 420, 421 |

- | | PAGE | | PAGE |
|---|----------------------------|--|----------------------|
| Milocarpin as oxytocic ... | 11. 13, 14 | Placenta membranacea ... | 1. 421, 466 |
| — bibliography ... | 11. 14, 504 | — morbid adherence of, causing | |
| — for inducing premature labour | 11. 495, 497 | retention ... | 11. 249, 252 |
| — in eclampsia ... | 11. 222 | — myxoma fibrosum of ... | 1. 471 |
| Pityriasis in new-born child... | 1. 312 | — new growths in ... | 1. 472 |
| — versicolor during pregnancy ... | 1. 88 | — normally inserted, premature | |
| Placenta ... | 1. 93, 104, 115 | detachment of ... | 1. 529 |
| — accessory ... | 1. 111 | — oedema of ... | 1. 467 |
| — adherent ... | 11. 249, 250, 251 | — partial detachment of ... | 11. 251 |
| — bibliography ... | 11. 258 | — pathology of ... | 1. 465 |
| — due to endometritis ... | 11. 250 | — physiological separation of ... | 1. 184, 185 |
| — due to placentitis ... | 11. 250 | — pigmentation of ... | 1. 471, 472 |
| — signs of ... | 11. 251 | — prævia ... | 1. 106, 466, 534 |
| — to foetus ... | 1. 114, 11. 177 | — ætiology ... | 1. 536 |
| — anomalies of ... | 1. 445 | — anaesthesia in treatment of ... | 1. 544 |
| — apoplexy of ... | 1. 468 | — associated with fibroid ... | 1. 399, 11. 144 |
| — artificial detachment of ... | 11. 253, 255 | — bibliography ... | 1. 551 |
| — atrophy of ... | 1. 466 | — causes ... | 1. 536 |
| — bathed in, <i>cf.</i> Insertio velamen- | | — causing transverse presenta- | |
| mentosa, ... | | tion ... | 11. 180 |
| — bulbs of ... | 1. 110 | — chloroform in ... | 1. 544 |
| — central detachment of ... | 1. 530 | — connected with pl. succen- | |
| — changes in, after death of foetus ... | 1. 500 | turata ... | 1. 537 |
| — circulation through ... | 1. 109, 133, 136, 203 | — dangers of ... | 1. 542 |
| — crushing of ... | 1. 549 | — definition ... | 1. 528, 534 |
| — cysts of ... | 1. 472 | — diagnosis of ... | 1. 542 |
| — detachment of ... | 1. 178, 185, 203 | — due to myoma ... | 1. 399, 11. 144 |
| — detachment of, owing to shock ... | 1. 529 | — ergot in ... | 1. 523 |
| — diagnosis of position of ... | 11. 617 | — extraction of foetus with ... | 1. 544, 545 |
| — examination of ... | 1. 264 | — frequency ... | 1. 537 |
| — excessive size of, causing reten- | | — hæmorrhage in ... | 1. 538, 544 |
| tion ... | 11. 249 | — management of ... | 1. 543 |
| — excessive size of, diagnosis ... | 11. 249 | — pains in ... | 1. 540 |
| — expression of ... | 1. 262, 264, 265 | — plugging of cervix in ... | 1. 546 |
| — expulsion of ... | 1. 185 | — presentation in ... | 1. 541 |
| — expulsion of, figures ... | 1. 184, 185 | — prognosis of ... | 1. 542 |
| — expulsion of, with twins ... | 1. 280, 285 | — progress ... | 1. 537 |
| — extraction of ... | 11. 253 | — symptoms of ... | 1. 539 |
| — extra-uterine ... | 1. 421 | — tampon in ... | 1. 546 |
| — fatty degeneration of ... | 1. 472 | — treatment of ... | 1. 543 |
| — fenestrata ... | 1. 111 | — use of tents in ... | 1. 546 |
| — fibromata of ... | 1. 472 | — varieties of ... | 1. 534 |
| — figure, showing layers of ... | 1. 105, 106 | — version, on account of ... | 1. 544 |
| — foetalis ... | 1. 104 | — prolapse of ... | 1. 550 |
| — functions of ... | 1. 133, 134 | — prolapse of, bibliography ... | 1. 551 |
| — hæmatoma of ... | 1. 468 | — prolapse of, diagnosis ... | 1. 550 |
| — hæmorrhage into ... | 1. 468 | — pus in ... | 1. 469 |
| — hepatisation of ... | 1. 468 | — rate of growth ... | 1. 104 |
| — hypertrophy of ... | 1. 467 | — removal of, bibliography ... | 1. 260, 11. 258 |
| — in multiple pregnancy ... | 1. 271, 272, 275, 285, 286 | — retained bits of, causing hæmor- | |
| — incarceration of ... | 11. 247 | rhage ... | 11. 379, 380 |
| — induration of ... | 1. 468 | — retention of ... | 11. 248 |
| — inflammation of ... | 1. 469 | — sarcoma of ... | 1. 472 |
| — injection of, before detachment ... | 11. 257 | — sclerosis of ... | 1. 471 |
| — insertion of ... | 1. 105 | — separation of, in natural labour ... | 1. 184, 185, 11. 228 |
| — insertion of, effect on inversion ... | 11. 262 | — serous infiltration of ... | 1. 467 |
| — lacuna of ... | 1. 107, 108 | — sinuses of ... | 1. 105 |
| — marginal sinus of ... | 1. 110 | — souffle of, so-called ... | 1. 144 |
| — marginal vessel of ... | 1. 536 | — spuria ... | 1. 166 |
| — materna ... | 1. 104 | — spuria, causing adherent chorion ... | 11. 252 |
| | | — structure of ... | 1. 105 |

- | | PAGE | | PAGE |
|--|----------------------|---|----------------------|
| Placenta succenturiata ... | I. 111, 550 | Poison, septic ... | II. 425, 426 |
| — causing hæmorrhage ... | II. 379 | Poisoning by phosphorus ... | I. 356 |
| — relation to placenta prævia ... | I. 537 | — uræmic, <i>cf.</i> Uræmia ... | I. 276 |
| — syphilis of ... | I. 471, 474 | Polymyositis parenchymatosa ... | II. 446 |
| — thrombosis of ... | I. 468 | Polypoid hæmatoma of vagina ... | II. 327 |
| — traction on, causing inversion of uterus ... | II. 262 | Polypus adnatis ... | II. 464 |
| — treatment of, in Caesarian section ... | II. 617, 618 | Polypus, fibrinous ... | I. 515, 516, II. 388 |
| — tumours of ... | I. 472 | — fibrinous, bibliography ... | I. 511 |
| — vena coronaria of ... | I. 110 | — fibrinous, figure of ... | I. 516 |
| — villi of ... | I. 107 | — placental ... | I. 512 |
| Placental area, post-mortem appearance of ... | I. 307 | — placental, causing hæmorrhage ... | II. 388 |
| — area, post-partum changes in ... | I. 293 | — produced by mole ... | I. 471 |
| — area, thrombosis at ... | I. 185 | — uterine, complicating pregnancy ... | I. 401 |
| — hæmorrhage ... | II. 227, 228 | — — diagnosis from inversion ... | II. 294 |
| — period ... | I. 184, 187 | — — obstructing labour ... | II. 114 |
| — period, bibliography ... | I. 249, 269 | Poppel on intra-uterine pressure ... | I. 191 |
| — period, inertia during ... | II. 9 | — porte-fillets of ... | II. 544 |
| — period, management ... | I. 264, 265, II. 235 | Porro's operation ... | II. 621, 622 |
| — polypus ... | I. 515 | — operation, bibliography ... | II. 625 |
| — polypus, causing hæmorrhage ... | II. 380 | — operation, mortality ... | II. 622 |
| — site, atony of, diagnosis ... | II. 246 | Porte-fillets ... | II. 518, 527, 544 |
| — site, atony of, treatment ... | II. 246 | Portio vaginalis ... | I. 31, 36 |
| — site, hæmorrhage from ... | II. 227 | — — annular laceration of ... | II. 64, 265 |
| Placentitis ... | I. 469 | — — — bibliography ... | II. 266 |
| — causing abortion ... | I. 470 | — — cancer of, causing dystocia ... | II. 119 |
| — causing adhesion of placenta ... | II. 250 | — — changes during pregnancy ... | I. 72 |
| Placentule succenturiata ... | I. 111 | — — detachment of ... | II. 64, 265 |
| Planes, ischial, effect on fetal head ... | I. 200 | — — injuries to ... | II. 263 |
| Plates, muscle ... | I. 90 | Position, definition ... | I. 127, 131 |
| Pledgets of cotton wool in plugging vagina ... | I. 524 | — lithotomy, for operations ... | II. 486 |
| Plethora during pregnancy ... | I. 84, 337, 339 | — of fetus abnormal ... | II. 193 |
| — serous, during pregnancy ... | I. 84, 337 | — — changes in ... | I. 192 |
| Pleurisy during pregnancy ... | I. 362 | — — diagnosis by auscultation ... | I. 206 |
| — during pregnancy, bibliography ... | I. 371 | — — diagnosis by palpation ... | I. 206 |
| — in puerperal fever ... | II. 442, 446 | — — during parturition ... | I. 205 |
| Pleuritic effusion in fetus ... | II. 169, 364 | — — first ... | I. 192 |
| Plexus, hypogastric ... | I. 51 | — — fourth ... | I. 215 |
| — venosus vaginalis ... | I. 45, 47 | — — in utero ... | I. 127, 131 |
| Plugging of cervix in abortion ... | I. 523 | — — literature of ... | I. 136 |
| — — cervix in placenta prævia ... | I. 546 | — — occipito-anterior ... | I. 211 |
| — — pulmonary artery ... | II. 352, 387 | — — occipito-posterior ... | I. 216 |
| — — uterus for hæmorrhage ... | II. 239 | — — — forceps with ... | II. 374 |
| — — vagina ... | I. 523, 524, II. 239 | — — second ... | I. 132, 215 |
| — — vagina, for inducing labour ... | II. 197 | — — subdivisions of ... | I. 201 |
| — — vagina, in abortion ... | I. 523 | — — third ... | I. 215 |
| — — vagina, in uterine inertia ... | II. 10 | — of head, anterior parietal ... | I. 213 |
| Plural pregnancy, <i>cf.</i> Multiple pregnancy. | | — of head, diagnosis with pelvic contraction ... | II. 85 |
| Pneumogastric, <i>cf.</i> Vagus. | | — of head, posterior parietal ... | I. 213 |
| Pneumonia during pregnancy ... | I. 361 | — of uterus altered by pregnancy ... | I. 400 |
| — fatal ... | II. 366, 373 | — relative, of twins ... | I. 280 |
| Podalic extraction ... | II. 529 | — semilithotomy, for operations ... | II. 487, 516 |
| — extraction, dangers of ... | II. 539 | Posterior superior iliac spines, distance apart ... | II. 36 |
| — version after perforation ... | II. 590 | Post-partum hæmorrhage ... | II. 525 |
| — <i>cf.</i> also Version. | | — hæmorrhage, <i>cf.</i> also Hæmorrhage. | |
| — for prolapsed cord ... | II. 339, 341 | — hæmorrhage, in placenta prævia ... | I. 541 |
| — in pelvic contraction ... | II. 87 | — period ... | I. 186, 285, 314 |
| — in transverse presentations ... | II. 192 | | |

	PAGE		PAGE
Pregnancy complicated by phthisis	1. 362, 371	Pregnancy, effect on spleen	1. 86
— pleurisy	1. 362, 371	— thorax	1. 86
— pneumonia	1. 361	— thyroid	1. 85
— relapsing fever	1. 355	— urine	1. 87
— respiratory disorders	1. 361, 371	— urine, <i>cf.</i> also Albuminuria,	
— scarlet fever	1. 353	Diabetes.	
— scarlet fever, bibliography	1. 370	— enteric fever during	1. 355
— small-pox	1. 352	— epi-ovarian	1. 129
— small-pox, bibliography	1. 370	— exanthemata during	1. 352, 359
— syphilis	1. 351, 361	— extra-peritoneal	1. 124
— syphilis, bibliography	1. 371	— extra-uterine	1. 113
— tuberculosis	1. 351, 362, 371	— bibliography	1. 434, 435, 441, 504
— typhoid	1. 355	— <i>cf.</i> also Extra-uterine.	
— typhus	1. 355	— effect on size of uterus	1. 64
— uncontrollable vomiting	1. 341, 350	— growth of uterus during	1. 65
— variola	1. 352, 370	— hematomata during	1. 316
— concealment of	1. 510	— hemophilia during	1. 339
— constipation during	1. 169, 345	— heart disease during	1. 351, 358, 371
— contractions of uterus during	1. 156	— hemeralopia during	1. 88, 342
— deafness during	1. 81, 88	— hydræmia during	1. 81, 347, 358
— death during	1. 367	— hydrotorax during	1. 411, 412
— death during, bibliography	1. 371	— hygiene of	1. 167
— diabetes during	1. 87, 462	— in rudimentary horn	1. 373, 376
— diagnosis between a first and a		— in uterus duplex	1. 372, 371
subsequent	1. 162	— influence of pelvic contraction on	1. 58
— diagnosis of	1. 139, 152, 155	— insanity during	1. 415, 420
— diagnosis of multiple	1. 277	— interstitial	1. 427
— diet during	1. 169	— leucorrhœa during	1. 413
— diseases of	1. 336	— literature of	1. 68, 89
— bibliography	1. 350, 371, 504	— longings during	1. 169
— <i>cf.</i> also Pregnancy, com-		— management of	1. 167
plimented.		— menstruation during	1. 352, 507, 531
— dress during	1. 168	— metritis during	1. 408, 418
— duration of	1. 64, 159	— mode of dress during	1. 168
— effect on abdominal walls	1. 81	— molar	1. 148, 461
— appetite	1. 86	— morning sickness due to	1. 86
— areola	1. 79	— multiple <i>cf.</i> also Multiple	1. 270
— attitude	1. 83	— nephritis during	1. 346, 11, 208, 216
— bladder	1. 80, 87, 345, 350	— neuritis during	1. 346, 347
— blood	1. 83, 337, 350	— nyctalopia during	1. 342
— carbonic acid excreted	1. 86	— œdema during	1. 340
— centre of gravity	1. 82	— open air exercise during	1. 168
— chest	1. 86	— osteophytes during	1. 86
— circulation	1. 85	— ovarian	1. 129
— diaphragm	1. 85	— ovarian, bibliography	1. 304
— digestion	1. 86, 311, 350	— parametritis during	1. 106
— gait	1. 83	— pathology of	1. 334
— heart	1. 85	— pathology of, bibliography	1. 370, 417, 504
— hips	1. 78	— perimetritis during	1. 106
— labia oris	1. 73	— period of, how calculated	1. 63
— lungs	1. 85	— period of, how diagnosed	1. 153
— maternal system	1. 67	— peritoneal	1. 100
— menstruation	1. 78	— pernicious anemia during	1. 333, 356
— nervous system	1. 88, 11, 415	— pigmentation during	1. 79, 87, 141, 346
— nipple	1. 79	— plethm during	1. 83, 84, 338
— organism as a whole	1. 83	— postic vaginals during	1. 73, 157
— pelvic connective tissue	1. 78	— prolapse of uterus during	1. 371
— pelvic points, <i>cf.</i> also		— protraction of	1. 161
Articulations	1. 78	— pruritus during	1. 334
— position of cervix	1. 76	— pseudo-menstruation during	1. 333
— rectum	1. 81		507, 531
— skin	1. 87		

- | | PAGE | | PAGE |
|--|----------------------------------|---|------------------------|
| Pregnancy, puerperal fever during ... | II. 433 | Presentation, face, rectification of ... | I. 129 |
| — purgatives during ... | I. 169 | — feeling ... | I. 204, 244 |
| — recurrence of molar ... | I. 455 | — flatling, in pelvic contraction ... | II. 60 |
| — relapsing fever during ... | I. 355 | — fore-vertex ... | I. 217, II. 68 |
| — renal disorders during ... | I. 345, II. 208, 216 | — fore-vertex, diagram of ... | II. 69 |
| — salivation during ... | I. 86, 344 | — knee ... | I. 204 |
| — secondary abdominal ... | I. 431 | — oblique ... | II. 178 |
| — signs of ... | I. 152 | — occipital ... | II. 70, 72 |
| — skin diseases during ... | I. 346 | — occipito-posterior ... | I. 216 |
| — strike during, <i>cf.</i> Strike ... | | — occipito-posterior, forceps in ... | II. 573 |
| — surgical operations during ... | I. 366 | — of anterior parietal bone ... | II. 73, 86, 575 |
| — — — bibliography ... | I. 371 | — ear ... | I. 219, II. 73, 74 |
| — symptoms of ... | I. 152 | — face, <i>cf.</i> Face presentations ... | |
| — thrombus during ... | II. 316 | — face, due to goitre ... | I. 490 |
| — tubal ... | I. 422 | — face, during pregnancy ... | I. 221 |
| — tubal, bibliography ... | I. 504 | — fetus ... | I. 204 |
| — uterine contractions during ... | I. 69, 156 | — fetus, in placenta previa ... | I. 541 |
| — uterine hemorrhage during ... | I. 565 | — knee ... | I. 204 |
| — vaginal ... | I. 434 | — posterior parietal bone ... | II. 73, 86 |
| — varices during ... | I. 81, 340 | — — — forceps with ... | II. 575 |
| — variola during ... | I. 352, 370 | — shoulder ... | II. 178 |
| — vital capacity during ... | I. 85 | — thigh ... | II. 194 |
| — vomiting during ... | I. 86, 341, 350 | — trunk ... | II. 178 |
| Premature fetal respiration ... | II. 357, 358, 362 | — twins ... | I. 280 |
| — fetal respiration, bibliography ... | II. 373 | — umbilical cord ... | II. 330, 337 |
| Premature labour, artificial ... | II. 488, 503 | — umbilical vessels ... | II. 226 |
| — labour, artificial, in eclampsia ... | II. 219, 223 | — umbilical vessels, biblio- | |
| — — associated with apnea ... | II. 359 | — graphy ... | II. 258 |
| — — bibliography ... | II. 513 | Presentation, pelvic ... | I. 204, 235 |
| — — definition ... | I. 507, 528, II. 488 | — frequency ... | I. 205 |
| — — due to variola ... | I. 352 | — in contracted pelvis ... | II. 75, 90 |
| — — in case of twins ... | I. 279 | — in flat pelvis ... | II. 75 |
| — — in contracted pelvis ... | II. 91 | — in generally contracted pelvis ... | II. 76 |
| — — in hydramnios ... | I. 463 | — shoulder ... | II. 178 |
| — — in moribund woman ... | I. 369 | Presentation, transverse ... | II. 178 |
| — — in pernicious anaemia ... | I. 339 | — causes ... | II. 180 |
| — — induction of ... | II. 488, 503 | — diagnosis of ... | II. 183 |
| — respiratory movements ... | II. 358, 362, 373 | — diagram ... | II. 179, 274 |
| — rupture of membranes ... | II. 199, 203 | — due to pelvic contraction ... | II. 60, 77 |
| — — — with pelvic contrac- | | — figure of ... | II. 179, 274 |
| — — — tion ... | II. 63 | — frequency ... | I. 205, II. 180 |
| Premontory signs of labour ... | I. 174, 175 | — prognosis ... | II. 190 |
| Prepuce ... | I. 46 | — progress in ... | II. 184 |
| Pre-entation, abnormal ... | II. 178 | — rectification of, during preg- | |
| — anterior parietal ... | I. 217 | — nancy ... | II. 191 |
| — arm ... | II. 194 | — requiring embryotomy ... | II. 193, 602 |
| — aurial ... | I. 219, II. 73, 74 | — treatment ... | II. 190, 602 |
| — breech ... | I. 204, 235 | — varieties of ... | II. 178 |
| — breech, <i>cf.</i> also Breech ... | | — version from ... | II. 514 |
| — breech, figure ... | I. 239 | — with pelvic contraction ... | II. 90 |
| — brow ... | I. 205, 231, 490, II. 60, 75, 86 | Presentation, vertex ... | I. 204, 209 |
| — brow, <i>cf.</i> also Brow ... | | — caput succedaneum of ... | I. 213 |
| — brow, diagnosis of ... | I. 232 | — frequency of ... | I. 205 |
| — brow, figure ... | I. 231, 234 | — preponderance of ... | I. 129, 205 |
| — extra-median ... | II. 73, 74, 86 | Pressure, abdominal ... | II. 3, 6 |
| — face ... | I. 201, 220 | — deficient, causing inertia ... | II. 6 |
| — face, <i>cf.</i> also Face ... | | — in pelvic contraction ... | II. 65 |
| — face, figure of ... | I. 225 | — premature use of ... | II. 6, 19 |
| — face, frequency of ... | I. 205 | — unduly strong ... | II. 18 |
| — face, in pelvic contraction ... | II. 60, 75, 86 | — weakness of ... | II. 18 |
| | | — arterial, in eclampsia ... | II. 212, 215, 217, 219 |

	PAGE		PAGE
Pressure, arterial, raised by pains ...	1. 178	Prolapse of uterus after precipitate labour ...	11. 14
— intra-abdominal ...	1. 80, 81	— uterus during pregnancy ...	1. 377, 417
— raised during labour ...	1. 178	— vagina during pregnancy ...	1. 377, 389
— intra-uterine ...	1. 180	Prolongation of cervix ...	1. 389
— intra-uterine, during pains ...	1. 191	— of cervix, bibliography ...	1. 417
— intra-uterine, during quiescence ...	1. 191	Promontory, causing injury to parturient canal ...	11. 78
— marks caused by pelvic contraction ...	11. 80, 81	— deformed by outgrowths ...	11. 129
— marks, <i>cf.</i> also Caput ...		— displacement of, in rickets ...	11. 47
— marks on skull in flat pelvis ...	11. 70, 76	— effect on mechanism of labour ...	1. 199, 201
— of body-weight, effect on pelvis ...	1. 21	— effect on shape of head ...	1. 210
— of uterus on detached placenta ...	1. 262	— elevation of, above symphysis ...	1. 17, 11. 39
— on aorta in hæmorrhage ...	11. 239	— false, <i>cf.</i> Promontory, second ...	
— on cord, avoidance of ...	11. 343	— height above symphysis ...	1. 17, 11. 39
— on uterus in hæmorrhage ...	11. 240	— marks on skull in flat pelvis ...	11. 70, 76
Priessnitz's pack in eclampsia ...	11. 222	— second ...	11. 37, 45, 50
— treatment in parametritis ...	11. 474	— true ...	1. 8
Primiparity, diagnosis of ...	1. 162	Prophylaxis of puerperal fever ...	11. 461, 481
Primitive kidneys ...	1. 117	Proportion of sexes at birth ...	1. 423
Processes, sharp pelvic, <i>cf.</i> Pelvis spinosa ...		Propulsion, axis of ...	1. 19, 216
Processes, sharp pelvic, injuring the uterus ...	11. 291, 292	Protracted labour and puerperal fever ...	11. 429
Processus vaginalis peritonei ...	1. 38	— labour causing rupture ...	11. 273
Procidencia uteri during pregnancy ...	1. 377	— labour due to inertia, <i>cf.</i> Inertia ...	
— uteri, labour in case of ...	1. 177	— labour due to pelvic contraction ...	11. 61
Production of heat in fetus ...	1. 133	— labour, forceps in ...	11. 564
— of heat in infant ...	1. 314	— pregnancy ...	1. 161
Prolapse of anterior vaginal wall ...	1. 380, 11. 156	Proud gait during pregnancy ...	1. 83
— arm ...	11. 194, 195	Pruritus during pregnancy ...	1. 346
— arm in transverse presentation ...	11. 178, 184	Pseudo-membranes in puerperal fever ...	11. 435, 437, 442
— arm, treatment ...	11. 195, 341	Pseudo-osteo-malacic pelvis ...	11. 114
— cord ...	11. 330, 344	Psoas abscess in puerperal fever ...	11. 441
— cord, <i>cf.</i> also Prolapse of ambliobal cord ...		— insertion of, forming spine ...	11. 50
— cord, necessitating version ...	11. 512	— minor, forming spine ...	11. 129
— cystic ovary ...	11. 154	Psychical condition at birth ...	1. 345
— foot ...	11. 197	— condition at birth, bibliography ...	1. 316
— foot, treatment ...	11. 198	— condition during pregnancy ...	1. 88
— intestines ...	1. 416	— influence on pains ...	11. 5
— — after rupture of uterus ...	11. 280, 283	Psychoses, puerperal ...	11. 413
— — after vaginal tear ...	11. 298	Ptyatin in new-born child ...	1. 344
— limbs ...	11. 194	Puberty ...	1. 59
— bibliography ...	11. 203	Pubic arch ...	1. 40
— with pelvic contraction ...	11. 60, 89	— crest, unusual sharpness of ...	11. 50, 129
— membranes ...	11. 199	Pubiotomy ...	11. 627
— membranes, bibliography ...	11. 203	Puerperal eclampsia ...	11. 264
— placenta ...	1. 550, 551	— endocarditis ...	11. 447
— posterior vaginal wall ...	1. 381	— endocarditis, bibliography ...	11. 480
— pregnant uterus ...	1. 377, 417	— fever ...	11. 429
— umbilical cord ...	11. 330	— — abscesses in ...	11. 440, 443, 450
— causes ...	11. 332	— — ætiology ...	11. 431
— diagnosis ...	11. 334	— — affecting bladder ...	11. 446
— — frequency ...	11. 331	— — brain ...	11. 447
— — in pelvic contraction ...	11. 60, 89	— — eye ...	11. 448
— — prognosis ...	11. 335	— — heart ...	11. 442, 447
— — treatment ...	11. 337, 340	— — joints ...	11. 443, 448
— uterus accompanying inversion ...	11. 259	— — kidneys ...	11. 446
		— — lactation ...	11. 450

	PAGE		PAGE
Puerperal fever affecting liver ...	II. 446	Puerperal state, arterial tension during ...	I. 289
— — — lungs ...	II. 446	— — bandage, in. <i>cf.</i> Abdominal bandage.	
— — — mammae ...	II. 447	— — bibliography ...	I. 307
— — — muscles ...	II. 449	— — bowels during ...	I. 291, 319
— — — ovaries ...	II. 441	— — changes in urine during ...	I. 290
— — — parotid ...	II. 447	— — collapse during ...	II. 349
— — — peritoneum ...	II. 441	— — condition of skin during ...	I. 290
— — — pleura ...	II. 442, 446	— — constipation during ...	I. 291, 319
— — — rectum ...	II. 446	— — diabetes during ...	I. 290
— — — spleen ...	II. 446	— — diagnosis of ...	I. 305
— — — thyroid ...	II. 447	— — diet during ...	I. 320, 323
— — — uterus ...	II. 436, 437	— — dysuria during ...	I. 291, 319
— — — vagina ...	II. 435	— — effect on abdominal walls ...	I. 291
— — antiseptics in ...	II. 461, 463, 464, 465, 467, 469	— — effect on fibroid ...	I. 400
— — auto-sepsis in ...	II. 428, 466	— — effect on phthisis ...	I. 363
— — bacteria in. <i>cf.</i> Bacteria.		— — lactosuria during ...	I. 291
Micro-organisms.		— — lechna during ...	I. 299, 318, II. 376
— — bibliography ...	II. 480	— — loss of hair during ...	I. 290
— — causes ...	II. 421	— — loss of weight during ...	I. 291
— — cellulitis in. <i>cf.</i> Parametritis.		— — management of ...	I. 316
— — diagnosis ...	II. 459	— — nervous system during ...	I. 291, 292
— — diphtheritic patches in ...	II. 435, 436, 437, 442	— — oedema during ...	I. 291
— — during pregnancy ...	II. 433	— — pathology of ...	II. 374
— — endocervicitis during ...	II. 435, 454	— — pathology <i>cf.</i> bibliography ...	II. 374, 389
— — endometritis during ...	II. 437, 454	— — pigment disappears during ...	I. 290
— — in different months ...	II. 431	— — pulse during ...	I. 289
— — micrococci in. <i>cf.</i> Micrococci, Bacteria.		— — respiration during ...	I. 289
— — mortality from ...	II. 420, 432	— — retention of urine during ...	I. 291, 319
— — oophoritis in ...	II. 441	— — scarlet fever during ...	II. 448, 481
— — parametritis in ...	II. 440, 453, 457	— — secretion of urine during ...	I. 290
— — period of incubation ...	II. 449, 450	— — specificity of ...	II. 421, 430
— — peritonitis ...	II. 441, 442, 455, 457	— — sudden death during ...	II. 349, 355
— — phlebitis in ...	II. 443	— — temperature of body during ...	I. 288
— — post-mortem appearances ...	II. 434	— — temporary diabetes during ...	I. 290
— — prevention of ...	II. 461	— — uterus during ...	I. 292, 293
— — prognosis ...	II. 460	— — varices during ...	II. 291
— — prophylaxis ...	II. 461	— — washing of vulva during ...	I. 318
— — pyæmia, <i>cf.</i> Septicæmia.		Puerperal tetanus ...	II. 482
— — relation to scarlet fever ...	II. 448, 461	— — tetanus, bibliography ...	II. 483
— — septic nature of ...	II. 423, 426, 427	— — tetanus, treatment ...	II. 483
— — specificity of ...	II. 430	— — tetany ...	II. 482
— — symptoms ...	II. 449	— — typhus ...	II. 444
— — temperature charts ...	Figs. 123, 124	— — ulcers and puerperal fever ...	II. 435, 474
— — treatment ...	II. 466	— — wounds ...	II. 422, 424, 425
— — varieties of ...	II. 434	— — wounds in puerperal fever ...	II. 454
— — infection, how conveyed ...	I. 252, II. 421, 426	Pulmonary air-vesicles, rupture of ...	II. 19
— — infection, prevention of ...	I. 253, II. 461	— — arteries, embolism of ...	II. 243, 350, 351
— — insanity, <i>cf.</i> Insanity ...	II. 413	— — plugging of ...	II. 352
— — insanity, bibliography ...	II. 420	— — plugging of, bibliography ...	II. 355
— — involution ...	I. 288, II. 375	— — disease during pregnancy ...	I. 361, 371
— — mania ...	II. 416, 417	— — embolism ...	II. 243, 350, 355
— — period, diet during ...	I. 320	Pulse, abdominal ...	I. 293
— — sores, treatment of ...	II. 474	Pulse, foetal ...	I. 143, 146, 154, 166
Puerperal state ...	I. 287, II. 374	— — foetal, effect of pains on ...	I. 147, 203
— — abdomen during ...	I. 291	— — foetal, in asphyxia ...	II. 362, 363
— — after-pains in. <i>cf.</i> Afterpains.		— — in childbed ...	I. 289
— — altered cardiac sounds during ...	I. 289	— — in childbed, bibliography ...	I. 307
— — appetite during ...	I. 291	— — in puerperal fever ...	II. 451
		Puncture of bladder in cases of retention of urine ...	I. 395

	PAGE		PAGE
Puncture of fetal sac in extra-uterine pregnancy ...	1. 441	Recto-abdominal examination ...	1. 152
— of hydrocephalic skull ...	11. 168	Rectocele, <i>cf.</i> Prolapse of posterior vaginal wall	
— of membranes in induction of abortion ...	11. 496, 503	Recto-vaginal fistula ...	11. 301
— of membranes in induction of labour ...	11. 496, 500, 503	— septum ...	1. 41
— of ovarian tumour ...	1. 406, 11. 153	— septum, rupture of ...	11. 301, 308
— of spina bifida ...	11. 172	Rectum ...	1. 41
— of uterus ...	1. 396, 415	— affected in puerperal fever ...	11. 446
Pupillary membrane ...	1. 119	— carcinoma of ...	11. 158
Pupils in eclampsia ...	11. 215	— <i>cf.</i> also Enemata.	
Purgatives during pregnancy ...	1. 169	— condition during pregnancy ...	1. 81, 345
— in eclampsia ...	11. 222, 225	— emptying of, before labour ...	1. 254
— in puerperal fever ...	11. 470	— loaded, causing inertia ...	11. 4
Purpura leading to hemorrhage ...	11. 232	— management of, during abortion ...	1. 522
Pus in placenta ...	1. 469	— management of, during labour ...	1. 254
Pustular colpitis ...	1. 414	— oedema of ...	1. 81
Putrefaction, intra-uterine, due to		— puncture of cyst per ...	11. 158
physometra ...	11. 345, 346	— puncture of ovum per ...	1. 495, 11. 509
— of fetus ...	1. 503, 514, 11. 288	— rupture of ...	11. 301, 308
— of membranes left in uterus ...	1. 514	— varices of ...	1. 81
— of remnants of placenta ...	11. 380	Reduced pelvis of Naegele ...	11. 51
Putrefactive germs causing disease ...	11. 422, 424, 428	Reduction of inverted uterus ...	11. 264
— virus different from septic ...	11. 422, 423, 426	Reflex activity in newborn child ...	1. 415
Putrescence of ovary ...	11. 441	— activity of fetus ...	1. 128, 232
— of uterus ...	11. 437	Reflex, decidua ...	1. 96
Putrid intoxication ...	11. 454, 455	— decidua, absence of ...	1. 446
Pyæmia, post-partum, <i>cf.</i> Puerperal fever.		— decidua, atrophy of ...	1. 447
Pyrexia causing death of fetus ...	1. 351, 497	— decidua, hypoplasia of ...	1. 447
		— in multiple pregnancy ...	1. 271
Q.		Refrigeration in puerperal fever ...	11. 474
Quadruplets ...	1. 270, 286	Regeneration of lost limb ...	1. 487
Quickening ...	1. 118, 153	Reinversion of inverted uterus ...	11. 267
Quinine as oxytocic ...	11. 13, 495	Relapsing fever in fetus ...	1. 351
— in ague ...	1. 357	— fever in pregnant woman ...	1. 355
— in galactorrhœa ...	11. 400	Relative atony ...	11. 282
— in induction of labour ...	11. 13, 495	Relaxation of uterus in inversion ...	11. 260, 261
— in insanity ...	11. 419	Removal of placenta from uterus ...	11. 253
— in phlegmasia alba dolens ...	11. 388	— of uterus for cancer ...	11. 151
— in puerperal fever ...	11. 472	— of uterus in Piro's operation ...	11. 621, 622
— in spasm of bladder ...	11. 391	Renal circulation in eclampsia ...	11. 214
R.		— disease, <i>cf.</i> also Albuminuria, Nephritis.	
Race, effect of, on pelvis ...	1. 23	— disease in eclampsia ...	11. 201, 210, 211, 213, 245, 247
Rachitis annulans ...	1. 490	— epithelium, sensitiveness of ...	11. 214
— <i>cf.</i> also Rickets ...	1. 487, 11. 30, 49, 53, 97, 118, 323	Repercussion, <i>cf.</i> Ballotement	
— micromelia ...	1. 480	Reposition of inverted uterus ...	11. 268
Reaction after hemorrhage ...	11. 241	— of prolapsed cord ...	11. 337
"Ready method" of Marshall Hall ...	11. 370	— of prolapsed uterus ...	1. 379
Recession of coccyx ...	1. 13, 18	— of retroflexed uterus ...	1. 393
Rectal alimntation ...	1. 314	— of uterine hernia ...	1. 383
Recti, diastasis of ...	1. 81, 382, 384, 11. 6	Repositor ...	11. 342
Rectification of face presentation ...	1. 229	— diagram of ...	11. 342
— of transverse lie ...	11. 191	Repossoirs ...	11. 269
— of transverse lie, <i>cf.</i> also Version.		Reserve blood ...	1. 267, 309
		— blood, importance to fetus ...	1. 262
		Resorption diabetes ...	1. 291
		— leturus ...	1. 358
		Respiration, artificial ...	11. 308
		— during delivery ...	11. 397, 398, 399
		— during delivery, bibliography ...	11. 373

- Respiration during eclamptic fit ... 11. 207
 — during puerperal state ... 1. 289
 — first, of new-born child ... 1. 203, 308
 — foetal ... 1. 133
 — rate of, increased during pains ... 1. 179
 — Stokes' ... 11. 207
 Respiratory centre, injury to, causing
 asphyxia ... 11. 358, 365
 disorders during pregnancy ... 1. 351, 361
 movements, prenaturo ... 11. 357, 358,
 362, 373
 requirements of premature foetus ... 11. 359
 Responsibility of parturient woman ... 11. 611
 Restoration of form ... 1. 190, 11. 4
 of head of foetus, *cf.* Rotation.
 Resuscitation of infant ... 11. 367, 370
 of infant, bibliography ... 11. 373
 Retention of dead foetus in utero ... 1. 498, 501
 of membranes in abortion ... 1. 513
 of placenta ... 11. 249, 253
 of substances in utero ... 1. 513, 11. 380,
 389
 of urine after delivery ... 1. 291, 319, 11. 394
 of urine causing dystocia ... 11. 156
 of urine during labour ... 1. 254
 of urine during pregnancy ... 1. 80, 389
 of urine during puerperal state ... 1. 291,
 319, 11. 394
 of urine in incarceration of
 uterus ... 1. 389
 Retinal affections during pregnancy ... 1. 350
 affections in puerperal fever ... 11. 448
 haemorrhage due to anaemia ... 1. 338
 Retraction of cervix ... 1. 182, 11. 272
 obstetrical internal os ... 11. 272, 279
 perineum ... 1. 183, 260
 uterus after delivery ... 1. 192, 298,
 11. 229
 uterus, imperfect ... 11. 378
 tonic uterine ... 11. 229
 Retractor uteri muscle ... 1. 36
 Retroceps of Hamon ... 11. 555
 Retro-cervical myoma ... 11. 146
 Retroflexion of gravid uterus ... 1. 346, 387,
 390, 397
 abortion for ... 1. 395
 bibliography ... 1. 417
 causes ... 1. 386
 diagnosis ... 1. 392
 incomplete ... 1. 392, 396
 replacement of ... 1. 388, 393
 symptoms of ... 1. 387
 treatment ... 1. 393
 uterus after delivery ... 11. 394
 causing haemorrhage ... 11. 379
 causing rupture of vagina ... 11. 298
 Retro-mammary abscess ... 11. 104, 406
 Retro-vaginal myoma ... 11. 146
 Retroversion of uterus, *cf.* Retroflexion.
 Rhagades, due to syphilis ... 1. 422
 of nipple ... 11. 401
 Rheumatism of uterus ... 1. 409, 11. 6
- Rhythm of uterine contractions ... 1. 176
 Richardson on local anaesthesia ... 11. 614
 Rickets, causing atrophy of bones ... 11. 48
 delayed ossification ... 11. 46
 detachment of epiphyses ... 1. 484
 generally contracted flat
 pelvis ... 11. 56
 hyperostosis ... 11. 48
 oblique pelvic contraction ... 11. 97
 pelvic contraction ... 11. 30, 44, 49, 53, 56
 rupture of pelvis ... 11. 323
 softening of bones ... 11. 48
 combined with osteo-malacia ... 11. 118
 congenital ... 1. 489
 external appearances of ... 1. 487
 foetal ... 1. 487, 489
 foetal, bibliography ... 1. 505
 histology of ... 1. 489
 influence on ossification ... 1. 487, 488
 intra-uterine ... 1. 487
 Rickety flat pelvis ... 11. 46
 flat pelvis, bibliography ... 11. 132
 flat pelvis, diagnosis ... 11. 51
 flat pelvis, diagrams of ... 11. 43, 48
 flat pelvis, physique ... 11. 49
 pelvis ... 11. 43, 44, 16, 49, 53, 56, 97, 118, 132
 skeletal pelvis ... 11. 51
 tri-radiate pelvis ... 11. 48, 112, 118
 tri-radiate pelvis, figure ... 11. 119
 Rigidity, cadaveric, of foetus ... 11. 164
 cadaveric, of foetus, bibliography ... 11. 164
 of cervix ... 11. 134
 of cervix, a cause of rupture ... 11. 272
 genital canal ... 11. 134
 hymen ... 11. 141
 os ... 11. 137
 perineum ... 1. 260, 11. 142
 uterine muscle ... 11. 22
 Rigors after delivery ... 1. 184
 in puerperal fever ... 11. 450
 Rima pudendi, *cf.* Vulva.
 Ring of Bandl, *cf.* Bandl.
 of Müller ... 1. 75
 Ritgen, cutting forceps of ... 11. 598
 Robert's pelvis ... 11. 105
 pelvis, bibliography ... 11. 132
 pelvis, causes ... 11. 106
 pelvis, diagnosis ... 11. 107
 pelvis, figure ... 11. 105
 Roderer, on expulsion corpore condu-
 plento ... 11. 189
 Roderer's glands ... 1. 57, 80
 obliquity of foetal head ... 1. 211
 Rokitsansky on atony of placental site ... 11. 245
 on osteophytes ... 1. 85
 Roman law on Caesarian section ... 1. 367, 11. 607
 Roofed in pelvis ... 11. 110, 120
 in pelvis, figure ... 11. 111
 Rosenmüller, organ of ... 1. 54
 Rosenstein on eclampsia ... 11. 212
 Rotation of foetal head ... 1. 211, 215, 216, 225
 Rotations of foetus ... 1. 198, 199

- | | PAGE | | PAGE |
|---|---------------------------|---|-----------------------|
| Rotations of foetus, abnormal | 11. 193 | Rupture of uterus due to myoma | 11. 141 |
| — of foetus, <i>cf.</i> also Super-rotations. | | — — — followed by recovery | 11. 281 |
| Round head, in pelvic presentation | 1. 242 | — — — frequency | 11. 271 |
| — ligaments, anatomy | 1. 37, 77 | — — — in pelvic contraction | 11. 64, 76 |
| — ligaments, as expelling agent | 1. 178 | — — — incomplete | 11. 286 |
| — ligaments, involution of | 1. 296 | — — — prognosis | 11. 286, 291 |
| Roussel's method of transfusion | 11. 244 | — — — prophylaxis | 11. 282, 291 |
| Rubbing the uterus in inertia | 11. 9 | — — — symptoms of | 11. 279, 287 |
| — through of cervix | 11. 64, 273, 286, 291 | — — — treatment | 11. 282, 295 |
| — through of parturient canal | 11. 78, 271, 291 | — — — varieties of | 11. 271, 277 |
| — through of uterus | 11. 78, 271, 273, 291 | Rupture of vagina | 11. 64, 78, 296, 306 |
| Rubeola, <i>cf.</i> Measles. | | — — — bibliography | 11. 327 |
| Ruge of cervix | 1. 50 | — — — diagnosis | 11. 305, 306 |
| — of vagina | 1. 47, 77 | — — — during labour | 11. 296 |
| Rupture, central | 11. 307, 309, 314 | — — — treatment | 11. 296 |
| — central, bibliography of | 11. 327 | — — — vestibule | 11. 306 |
| — circular, of portio | 11. 65, 295 | Rupture, perineal | 11. 306 |
| — of air-vesicles during labour | 11. 19 | — ante partum | 11. 307 |
| — — amnion, <i>cf.</i> Amnion. | | — — bibliography | 11. 327 |
| — — bladder | 1. 391 | — — causes | 11. 307 |
| — — bladder during labour | 11. 292, 301 | — — <i>cf.</i> also Rupture, central. | |
| — — cervix | 11. 64, 272, 286, 293 | — — diagram of | 11. 306 |
| — — cervix, bibliography | 11. 327 | — — frequency | 11. 307 |
| — — cervix in precipitate labour | 11. 19 | — — prevention of | 1. 258, 290, 11. 311 |
| — — chorion, <i>cf.</i> Chorion. | | — — treatment | 11. 311 |
| — — cord, <i>cf.</i> Umbilical cord. | | — — varieties | 11. 307 |
| — — diseased pelvis | 11. 323 | — — premature, of membranes | 11. 63, 199, 206 |
| — — fourchette | 11. 307 | Russian tea | 1. 324, 11. 244 |
| — — hydrocephalic skull | 11. 167 | | |
| — — hymen during labour | 11. 141 | S. | |
| — — ilio-sacral synchondrosis | 11. 322, 325 | Sac, extra-uterine foetal | 1. 423, 430, 437, 438 |
| — — membranes, artificial | 11. 199 | — — — aspiration of | 1. 441 |
| — — membranes, <i>cf.</i> also Membranes. | | — — — electro-puncture of | 1. 441 |
| — — membranes, delayed | 11. 199 | — — — rupture of | 1. 423, 435, 441 |
| — — membranes in inertia | 11. 10 | — — — suppuration of | 1. 438, 434, 441 |
| — — membranes, premature | 11. 63, 199, 203 | — — — treatment by electric shock | 1. 441 |
| — — pelvic joints | 1. 115, 11. 79, 321 | — — — treatment by morphia | 1. 441 |
| — — pelvic joints, bibliography | 11. 327 | — of spina bida, <i>cf.</i> also Spina bida | 11. 171 |
| — — pelvic joints, diagnosis | 11. 324, 325 | Sacro-cotyloid distance | 1. 13, 11. 40 |
| — — pelvic joints, treatment | 11. 326 | — interval in Naegele pelvis | 11. 96 |
| — of perinaeum | 11. 142, 306 | Sacro-iliac joint, <i>cf.</i> Articulation. | |
| — — after precipitate labour | 11. 18 | Sacrum | 1. 8, 9, 15 |
| — — bibliography | 11. 327 | — altered position in flat pelvis | 11. 61 |
| — — <i>cf.</i> also Rupture, perineal | | — asymmetry in Naegele pelvis | 11. 91 |
| — — diagram | 11. 308 | — atrophy in Naegele pelvis | 11. 93 |
| Rupture of rectum during labour | 11. 301 | — effect of, in development of pelvis | 1. 21 |
| — — sac of extra-uterine foetus | 1. 442 | — position in infantile pelvis | 1. 25 |
| — — sphincter ani | 11. 308 | — rotation of, in kyphotic pelvis | 11. 101 |
| — — symphysis pubis | 11. 322 | — rotation of, in rickets | 11. 47, 56 |
| Rupture of umbilical cord | 11. 18, 328 | — sexual differences in | 1. 29 |
| — of umbilical cord, bibliography | 11. 344 | Saddle in spondylobisthesis | 11. 122 |
| — of umbilical vessels | 11. 226 | Sagittal suture | 1. 124, 198, 216 |
| Rupture of uterus | 1. 415, 11. 270, 271, 286 | — suture, during difficult labours | 11. 65 |
| — — bibliography | 1. 415, 118, 11. 281, 327 | — suture, in vertex presentations | 1. 211, 217 |
| — — complete | 11. 277 | Salicylate of sodium as antipyretic | 11. 67 |
| — — diagnosis | 1. 416, 11. 279, 287 | Salicylic acid in midwifery | 11. 66, 67 |
| — — diagram | 11. 276 | Saliva in new-born child | 1. 34 |
| — — due to hydrocephalus | 11. 167 | Salivation during pregnancy | 1. 86, 34 |
| | | Salpingitis | 11. 47 |

- Sand bag in uterine hæmorrhage** ... II. 240
- Singer on Cæsarian section** ... II. 617, 619
- Sanguinis stillitidium** ... I. 539
- Sarcoma obstructing pelvis** ... II. 128
- of brain causing convulsions ... II. 216
- of placenta ... I. 472
- Sausage-shaped bag of membranes** II. 183, 185
- Sawing movements in separating placenta** ... II. 255
- Scalp, eczema of, during pregnancy** ... I. 87
- fetal, edema of ... I. 182
- tumours, *cf.* Caput.
- Scanzoni, auchenister of** ... II. 603
- on lie of fetus ... I. 131
- Scapula, injury to, during labour** ... II. 550
- Scarifications of lips of os** ... I. 379, 380
- Scarlet fever during childbed** ... II. 427
- during childbed, bibliography ... II. 481
- during pregnancy ... I. 353
- during pregnancy, bibliography ... I. 370
- during puerperal fever ... II. 448, 481
- Schatz on treatment of face presentations** ... I. 230
- Schizomycetes in new-born child** ... II. 477
- in puerperal fever ... II. 448, 445, 447
- Schultze, callipers of** ... II. 32
- on artificial respiration ... II. 369, 370, 371
- on expulsion of placenta ... I. 184
- on fetal asphyxia ... II. 357, 359
- pessary of ... I. 394
- sickle knife of ... II. 603
- Scentic nerve in eclampsia** ... II. 216, 217
- Serve, neuralgia of** ... II. 397
- Scirrhus, *cf.* Cancer.**
- Scissors in armamentarium** ... I. 251
- Nagels ... II. 586
- perforator ... II. 586, 588
- perforator, dangers of ... II. 587
- Sclerosis of the placenta** ... I. 471
- Serotonin acid** ... II. 12
- Seriosis causing pelvic contraction** ... II. 97
- lumbar ... II. 51
- Serotic rickets pelvis** ... II. 51
- Sesop, Simon's** ... I. 526
- Sesmer in abortion** ... I. 526
- Serrating during labour** ... I. 257
- Serofulosis causing pelvic contraction** ... II. 53
- *cf.* also Tuberculosis.
- Seasons, relation of, to puerperal fever** ... II. 431
- Sebaceous glands of areola** ... I. 57
- glands of labia majora ... I. 45
- matter, *cf.* Vernix.
- Seide cornutum** ... II. 11
- cornutum, *cf.* also Ergot.
- Secondary abdominal pregnancy** ... I. 431
- gastrotomy ... I. 445
- hæmorrhage ... II. 228, 378, 380
- Seebo Cæsarea, *cf.* Cæsarian section.**
- Section, abdominal, *cf.* Gastrotomy, Cæsarian section.**
- Cæsarian, *cf.* also Cæsarian ... II. 607
- Secretion, lochial, *cf.* Lochia.**
- Secretion of milk, *cf.* Mammary glands, Lactation.**
- of urine by fetus ... I. 103, 133
- of urine, *cf.* also Urine.
- Secundines, *cf.* Membranes, Decidua.**
- Segment, lower uterine** ... I. 176, 192, 193, 237
- bibliography ... I. 250
- *cf.* also Lower segment.
- rupture of ... II. 270, 272, 276
- Segmentation of yolk** ... I. 90
- Seignefalotomo, Fenizio's** ... II. 598
- Self-amputation, intra-uterine** ... I. 460
- Self-infection, *cf.* Auto-sepsis.**
- Self-mutilation** ... I. 478
- Seltzer water in cystitis** ... II. 392
- Semen** ... I. 64
- imperfect introduction of ... II. 141
- migration of ... I. 372
- Semi-lithotomy position** ... II. 487, 518
- Sennelweis on puerperal fever** ... II. 421
- Sensations, tactile, in new-born child** ... I. 315
- tactile, in separating placenta ... II. 255
- Senses, activity of, in new-born child** ... I. 315
- Sensitiveness of breasts during menstruation** ... I. 61
- Separation of placenta** ... II. 228, 255
- of placenta, *cf.* also Placenta.
- Sepsis, *cf.* also Septicæmia.**
- lymphatic ... II. 444, 451, 453
- puerperal, *cf.* Puerperal septicæmia.
- venous ... II. 380, 444, 451, 453
- Septicæmia after abortion** ... I. 515, 517, 527
- bacteria in, *cf.* Bacteria, Micrococci.
- due to physometra ... II. 548
- due to retained masses ... II. 380
- in new-born child ... II. 476, 482
- involving breasts ... II. 408
- lymphatic ... II. 423, 442, 444, 451
- phlebotic ... II. 380, 423, 428, 444, 452
- puerperal ... II. 420
- puerperal, bibliography ... II. 480
- puerperal, *cf.* also Puerperal fever ... II. 420
- venous ... II. 380, 423, 428, 444, 452
- Septic disease, *cf.* also Septicæmia.**
- disease of mother ... II. 420
- disease of new-born child ... II. 476, 482
- infection, prevention of ... I. 253, II. 461
- infection, when conveyed ... I. 252, II. 129
- poison ... II. 423, 426
- processes accompanying pelvic contraction ... II. 79
- virus distinct from putrefactive ... II. 426
- Septum, recto-vaginal** ... I. 41
- recto-vaginal, injury to ... II. 301, 308
- urethro-vaginal ... I. 39
- vesico-vaginal, injury to ... II. 300
- Serosa, *cf.* Peritoneum.**
- injury to uterine ... II. 271, 275, 278

- | | PAGE | | PAGE |
|---|--------------------------|--|----------------------|
| Sero-sanguineous swelling after delivery ... | 1, 310 | Shortening of cervix during pregnancy ... | 1, 72 |
| — <i>cf.</i> also Caput saccellaneum. | | Shortness of cord, undue ... | 1, 114, 11, 201, 202 |
| — due to labour ... | 1, 182, 197, 202 | — of cord, undue, bibliography ... | 11, 202 |
| — primary ... | 1, 182, 197, 202, 11, 80 | — of cord, undue, diagnosis ... | 11, 201 |
| — secondary ... | 1, 183, 219, 11, 80 | Shoulder-joint dislocated during labour ... | 11, 551 |
| Serotina, decidua, <i>cf.</i> also Decidua ... | 1, 447 | Shoulder presentations ... | 11, 117 |
| — destruction of, by mole ... | 1, 454 | Shoulders causing dystocia ... | 11, 161 |
| Serous cystitis ... | 11, 390, 395 | — delivery of the ... | 1, 212, 213, 215 |
| — discharge from uterus during pregnancy ... | 1, 165, 411 | — extraction of the ... | 1, 261 |
| — discharge in extra-uterine pregnancy ... | 1, 436 | — unusual breadth of the ... | 11, 161 |
| — membranes, <i>cf.</i> Peritoneum. | | Show ... | 1, 180 |
| Serre-fines in hemorrhage ... | 11, 306 | Shrivelling of fetus ... | 1, 500, 501 |
| — in ruptured perineum ... | 11, 311 | Sickle knife, Schultze's ... | 11, 601 |
| Serum, accumulation of, in abdomen of fetus ... | 11, 169 | Sickness, morning ... | 1, 8 |
| — <i>cf.</i> also Serous. | | — morning, excessive ... | 1, 341, 35 |
| Sex, diagnosis of, before birth ... | 1, 165 | Sigault on symphysectomy ... | 11, 62 |
| — of fetus affecting duration of labour ... | 1, 187 | Signs, auscultatory, <i>cf.</i> Auscultation. | |
| — of twins ... | 1, 271 | — of parity ... | 1, 171 |
| — relation to puerperal fever ... | 11, 430 | — of pregnancy ... | 1, 153 |
| Sexes, proportion of, at birth ... | 1, 123 | Silver nitrate for sore nipple ... | 11, 401 |
| Sexual apparatus ... | 1, 29 | Silvester on artificial respiration ... | 11, 571 |
| — characters in infantile pelvis ... | 1, 19, 20 | Simon's method of irrigating rectum ... | 1, 52 |
| — desire increased during menstruation ... | 1, 61 | — scoop ... | 1, 521 |
| — differences in pelvis ... | 1, 22 | — urethral speculum ... | 11, 391 |
| — excess causing abortion ... | 1, 170 | Simpson, air-tractor of ... | 11, 53 |
| — intercourse ... | 1, 64, 65, 521 | — basistyl of ... | 11, 55 |
| — intercourse, <i>cf.</i> also Coitus. | | — on cranioclast ... | 11, 59 |
| — maturity ... | 1, 59, 62 | — on placental hemorrhage ... | 11, 53 |
| — organs, anomalies of ... | 1, 371, 11, 133 | — on puerperal psychoses ... | 11, 41 |
| — organs, development of ... | 1, 118 | — on puerperal tetanus ... | 11, 48 |
| — organs, malformation of ... | 1, 371, 11, 133 | — on spondylotomy ... | 11, 193, 401 |
| Shape of cervix in diagnosing abortion ... | 1, 519 | Sims' speculum ... | 1, 526, 11, 501 |
| — of fetal head affected by labour ... | 1, 201, 213 | Sinus, marginal, of placenta ... | 1, 141 |
| — of fetal head, <i>cf.</i> also Head, Caput. | | Sinuses, uterine ... | 1, 6 |
| — of pelvis, development of ... | 1, 19 | — uterine, hemorrhage from, <i>cf.</i> Hemorrhage. | |
| — of uterus during "pains" ... | 1, 189 | — uterine, thrombosis of ... | 1, 536, 11 |
| — of uterus during pregnancy ... | 1, 69 | Site, placental, <i>cf.</i> also Placenta. | |
| She-ass, milk of, for infant ... | 1, 328 | — placental, hemorrhage from ... | 11, 22 |
| Sheath of cord, anomalies of ... | 1, 475, 476 | Size of fetus, a means of diagnosing pregnancy ... | 1, 115, 119, 161 |
| — of cord, <i>cf.</i> also Umbilical sheath. | | — of fetus, affects duration of labour ... | 1, 181 |
| Sheep, lithopædion in ... | 1, 502 | — of fetus and induction of labour ... | 11, 69 |
| Shield left by extra-uterine fetal sac ... | 1, 434 | — of fetus and pelvic contraction ... | 11, 8 |
| Shield, india-rubber, for nipple ... | 1, 324, 11, 402 | — of fetus, how affected ... | 1, 12 |
| — leaden ... | 11, 403 | — of mammary glands during pregnancy ... | 1, 71 |
| Shivering after death of fetus ... | 1, 165 | — of uterus during pregnancy ... | 1, 68, 155, 161 |
| — after delivery ... | 1, 184 | — of uterus in nullipara ... | 1, 32, 6 |
| Shock caused by inversion of uterus ... | 11, 263 | Skin, condition of, post partum ... | 1, 29 |
| — <i>cf.</i> also Collapse. | | — development of fetal ... | 1, 91 |
| — detaching placenta ... | 1, 520 | — diseases of, during pregnancy ... | 1, 34 |
| — electric, in extra-uterine pregnancy ... | 1, 441 | — — — — bibliography ... | 1, 35 |
| — treatment of ... | 1, 533 | — effect of pregnancy on, 1, 81, 82, 87, 161 | |
| — with rupture of uterus ... | 11, 279, 280, 282 | — of fetus, syphilitic changes in ... | 1, 42 |
| Shortening of cervix during pangs ... | 1, 73, 159, 164 | — of new-born child, changes in, 1, 312, 311 | |
| | | Sclerotic acid ... | 11, 1 |

- | | PAGE | | PAGE |
|--|---------------------------|---|-----------------------|
| Skoliosis causing pelvic contraction... | II. 97 | Specific gravity of uterus ... | I. 80 |
| — lumbar ... | II. 51 | Specificity of puerperal fever ... | II. 421, 430 |
| Skoliotic rickety pelvis ... | II. 51 | Speculum causing loss of epithelium ... | II. 422 |
| Skull, <i>cf.</i> also Cranium. | | — during perforation ... | II. 589 |
| — configuration of, <i>cf.</i> Moulding. | | — in diagnosis of pregnancy ... | I. 149 |
| — fractures of foetal ... | I. 484, II. 81, 547 | — Sims' ... | I. 526, II. 589 |
| — hydrocephalic ... | II. 166 | — urethral ... | II. 394 |
| — — <i>cf.</i> also Hydrocephalus. | | Spermatozoa ... | I. 64 |
| — injury to, during labour ... | II. 547 | — imperfect introduction of ... | II. 141 |
| — of foetus, anatomy ... | I. 123, 126 | — migration of ... | I. 372 |
| — — — fontanelles, <i>cf.</i> Fontanelles. | | Sphenosiphon ... | II. 496 |
| Slipping of forceps ... | II. 570, 577 | Sphenostresia of Hubert ... | II. 598 |
| — of forceps, treatment ... | II. 578 | Sphincter ani, rupture of ... | II. 368 |
| — of forceps, varieties ... | II. 577 | — uteri ... | I. 48 |
| Sloughing, <i>cf.</i> Gangrene, Suppuration. | | Spiegelberg on augmentation of blood | |
| — of inverted uterus ... | II. 264 | — during pregnancy ... | I. 83, 84, 399 |
| Small-pox during pregnancy ... | I. 352 | — on conditional indications for | |
| — during pregnancy, bibliography ... | I. 370 | — Caesarian section ... | II. 611 |
| — in foetus ... | I. 353 | — on management of after-birth | |
| Smell in new-born babe ... | I. 315 | — stage ... | I. 262, 265 |
| — of lochia, offensive, <i>cf.</i> Lochia. | | — on origin of menstrual blood ... | I. 61 |
| Smellie, forceps of ... | II. 554, 555 | — on plethora during pregnancy ... | I. 339 |
| — hook of ... | II. 543 | Spina bifida, ante-partum diagnosis | |
| — on extraction of head ... | II. 537, 539, 540 | — of ... | II. 171 |
| Sodium bromide in insanity ... | II. 449 | — — causing dystocia ... | II. 170, 171 |
| — hypochlorite, as disinfectant ... | II. 464 | — — causing spondylolisthesis ... | II. 123 |
| — salicylate, as antipyretic ... | II. 473 | — — diagnosis from hydrocephalus ... | II. 171 |
| Softening of bones in osteo-malacia ... | II. 113, | — — puncture of ... | II. 172 |
| — — — 116, 117 | | — — iliac ... | I. 9, II. 32, 34 |
| — of bones in rickets ... | II. 48 | Spinal column, injury to ... | II. 547, 548 |
| — of pelvic joints ... | I. 414, 415 | — curvature accompanying pelvic | |
| — of pelvic joints, <i>cf.</i> also Articulations. | | — contraction ... | II. 81 |
| Soil uncongential to foetus ... | I. 497 | — curvature causing oblique pelvic | |
| Solayres' obliquity of head ... | I. 210 | — contraction ... | II. 97 |
| Solid matters, passage into blood of | | — nerve centres for uterus ... | I. 173 |
| — foetus ... | I. 134 | Spine due to insertion of psoas ... | II. 50, 129 |
| Somato-pleural plates ... | I. 90 | — due to muscular traction ... | II. 129 |
| Sore nipples ... | II. 401 | Spines, iliac, distance apart ... | I. 9, II. 32 |
| — nipples, bibliography ... | II. 412 | — iliac, posterior superior, distance | |
| — nipples, <i>cf.</i> also Nipple. | | — apart ... | II. 36 |
| Souffle, extra-uterine ... | I. 145 | — ischial, distance apart ... | I. 14 |
| — so-called placental ... | I. 144 | — ischial, influence on foetal head ... | I. 200 |
| — umbilical ... | I. 143, 147 | — pelvic, causing injury to par- | |
| — uterine ... | I. 143, 144 | — turient canal ... | II. 64, 78, 291 |
| — — bibliography ... | I. 166 | — pelvic, <i>cf.</i> also Spinous pelvis. | |
| — — in extra-uterine pregnancy ... | I. 136 | Spinous pelvis ... | II. 50, 129, 291, 292 |
| Sound in diagnosing extra-uterine | | — pelvis injuring cervix ... | II. 64, 291, 292 |
| — pregnancy ... | I. 138 | Spiral turns of umbilical cord ... | I. 113, 479 |
| — in diagnosing recent delivery ... | I. 306 | Spirilla in blood of foetus ... | I. 351 |
| — in diagnosing uterine inversion ... | II. 266 | Splanchno-pleural plates ... | I. 90 |
| — uterine ... | I. 149, 306, 438, II. 266 | Spleen during pregnancy ... | I. 86 |
| Spasm of bladder after delivery ... | II. 393 | — in puerperal fever ... | II. 146 |
| — of uterus ... | II. 20 | — syphilitic foetal ... | I. 491, 494, 496 |
| — of uterus, bibliography ... | II. 25 | — tumours of, causing dystocia ... | II. 170 |
| Spasmodic constriction of foetus ... | II. 21, 22, | Splinters of bone causing fistula ... | II. 301 |
| — — — 186, 192 | | Splt. pelvis ... | II. 130 |
| — pains ... | II. 20 | — pelvis, bibliography ... | II. 133 |
| — pains, bibliography ... | II. 25 | — pelvis, dilatability of ... | II. 131 |
| — stricture of uterus ... | II. 20, 22 | Spondylolisthesis ... | II. 110, 119, 123 |
| — stricture of uterus, <i>cf.</i> also Tetanus. | | — bibliography ... | II. 133 |
| Specific gravity of foetus ... | I. 129 | — diagnosis ... | II. 123 |
| | | — figures of ... | II. 120, 121 |

	PAGE		PAGE
Spondylolizema	11. 110	Striae of gluteal region ...	1. 82
— bibliography	11. 132	— of thighs	1. 82
Spondylotomy	11. 193, 603	Stricture of external os ...	11. 22
Sponge tents	1. 523, 546, 11. 246	— of external os, treatment ...	11. 23
— — <i>cf.</i> also Tents.		— of internal os	11. 23
— — for inducing labour ...	11. 496, 498, 499	— of uterus	11. 20, 22, 246, 247, 257
Spontaneous amputation ...	1. 460, 486, 505	— of uterus, diagnosis	11. 244
— evolution	11. 186, 193	— of uterus, spasmodic	11. 20, 22
— evolution, bibliography ...	11. 203	Stroma of ovary	1. 53
— evolution, diagram	11. 188	Styptics, <i>cf.</i> also Hemorrhage, Peri-	
— evolution, in contracted pelvis	11. 77	chloride of Iron, Ergot.	
— version	11. 184	— for hemorrhage from uterus ...	11. 238, 239, 246
— version, bibliography	11. 203	Subinvolution after abortion ...	1. 517
Spray, carbolic	11. 469	— causes of	1. 517
Spurious liquor amnii	1. 101, 182, 277, 412, 11. 185	Submammary abscess	11. 404, 406, 409
Squamous suture	1. 124	Subperitoneal emphysema	11. 288
— suture, rupture of	11. 81, 547	— emphysema, bibliography ...	11. 288
Squeezed in pelvis	11. 27	— fibroids	11. 145
— in pelvis, <i>cf.</i> Tri-radiate.		— haematoma	11. 288
St. Germain's tea	1. 319	Subzonal membrane	1. 62
St. Vitus' dance, <i>cf.</i> also Chorea	1. 347	Suckling after uterine hemorrhage	11. 244
Stage of crowning	1. 182	— arrest of, effect on milk	1. 302
— — dilatation	1. 179, 255	— <i>cf.</i> also Weaning.	
— — dilatation, inertia during ...	11. 6	— contra-indications to	1. 320, 321
— — expulsion	1. 182, 257	— early, desirable	1. 322
— — expulsion, inertia during ...	11. 7	— effect on after-pains	1. 299
— — the after-birth	1. 184, 264	— effect on involution	1. 320
— placental	1. 184, 264	— forbidden in tuberculosis ...	1. 363, 11. 407
— placental, inertia during	11. 7	— frequency of	1. 322
— placental, management of ...	1. 264	— in acute diseases	1. 321
— post-partum	1. 186, 260	— of child a duty	1. 320
Stages of labour	1. 179, 255, 257, 264	Sudamina in new-born child ...	1. 312
— of labour, duration of	1. 187	Sudden death during childbirth ...	11. 349, 355
State, puerperal, <i>cf.</i> Puerperal.		— death during labour	11. 349, 355
Stays during pregnancy	1. 168	Suffocation, <i>cf.</i> Asphyxia	11. 357
Steam baths in uterine inertia ...	11. 9	Sugar, amount of, in milk	1. 304
Steepest of anterior pelvic wall ...	11. 39	— <i>cf.</i> also Diabetes.	
— of symphysis	11. 39	— in liquor amnii	1. 362
Stenosis, cervical	11. 134, 137	— in urine during pregnancy ...	1. 67
— cervical, bibliography	11. 137, 159	Subsidal insanity	11. 415
— of genital canal	11. 134, 159	Subsides, intra-uterine	1. 477
— of umbilical vessels	1. 480	Sulphate of magnesia after delivery ...	1. 319
— vaginal	11. 138	Sulphuric acid after hemorrhage ...	11. 244
— vaginal, causing rupture	11. 300	— ether after hemorrhage	11. 242
Sterno-mastoid, hæmatoma of ...	11. 546	Superfecundation	1. 275
Sternum, fracture of	11. 19	Superfetation	1. 276
— fracture of, bibliography	11. 19	Super-rotations of fœtus	1. 219, 241
Stethoscope	1. 251	Support of perineum	1. 229, 248, 258
Stigmata of follicles	1. 60	— of perineum, bibliography ...	1. 268
Stillbirth sanguinis	1. 539	Supra-renals of fœtus, syphilis in ...	1. 421, 421, 490
Stimulants after hemorrhage ...	11. 241, 242	Suppression of urine in eclampsia ...	11. 213
— <i>cf.</i> also Alcohol.		Suppuration, <i>cf.</i> also Abscess.	
— in eclampsia	11. 223	— in extra-uterine pregnancy ...	1. 433, 434, 437
— in uterine inertia	11. 9	— of breast	11. 101, 106, 109
Stokes' respiration during eclampsia	11. 207	— relation to puerperal fever ...	11. 437
Stoltz on pubiotomy	11. 623	Surgical operations during pregnancy	1. 366
Strait of pelvis	1. 12, 13, 11. 40	— operations during pregnancy,	
Strangulation of intestine by inverted		— bibliography	1. 371
uterus	11. 264	Suspended animation, <i>cf.</i> Asphyxia ...	11. 356
Striae of abdomen	1. 81, 82, 162, 163		
— of breasts	1. 79		

- | | PAGE | | PAGE |
|---|-------------------|--|---------------------------|
| Suspended animation, definition of... | II. 364 | Syphilis, effect on serous membranes | I. 491, 492, 496 |
| Suture, coronal | I. 124 | — — — skin | I. 491, 496 |
| — frontal | I. 124 | — — — spleen | I. 491, 494, 496 |
| — lambdoidal | I. 124 | — — — supra-renals | I. 491, 494, 496 |
| — sagittal | I. 124, 198 | — — — thymus | I. 491, 492 |
| — — in flat pelvis | II. 68, 69 | — — — umbilical blood-vessels | I. 481 |
| — — in generally contracted pelvis | II. 70 | — foetal | I. 165, 364, 491, II. 492 |
| — — with abnormal presentations | II. 73 | — foetal, bibliography | I. 505 |
| — — with vertex presentations ... | I. 212 | — hepatic | I. 491, 493, 496, II. 163 |
| — squamous | I. 124 | — in father | I. 364 |
| — squamous, rupture of | II. 81, 547 | — in mother | I. 165, 364 |
| Sutures, condition in hydrocephalus | II. 165 | — in nursing woman | I. 321 |
| — elastic | II. 619, 621 | — transmission of, to foetus | I. 364, 371 |
| — in Caesarian section | II. 619 | — treatment by mercury | I. 365 |
| — in ruptured perineum | II. 311, 312, 313 | Syphilitic pemphigus... .. | I. 491 |
| — of foetal head | I. 118, 124 | — ulceration causing stenosis ... | II. 137 |
| — three-plane | II. 313 | Syringe, a part of armamentarium ... | I. 251, II. 239 |
| — width of, in diagnosis of size of head | II. 84 | | |
| Swelling of breasts during menstruation | I. 61 | T. | |
| Sylvester on artificial respiration ... | II. 370 | Tabs lacten | II. 400 |
| Sylvian fossa in foetus | I. 121 | Tactile sensations in new-born child | I. 315 |
| Symphysiotomy | II. 623 | — — sensations in removing placenta | II. 255 |
| — effect of, in enlarging pelvis | II. 324, 623 | Tampon, <i>cf.</i> also Plugging, Bags. | |
| Symphysial cartilage, undue projection of | II. 50 | — vaginal, in hemorrhage | I. 532 |
| Symphysis, angle between, and conjugata vera | II. 39 | — vaginal, mode of introducing ... | I. 523, 524 |
| — fissure of | II. 130 | Tannin as haemostatic | II. 238 |
| — height of | II. 39 | — for sore nipples | II. 402 |
| — inclination of, figure | II. 38 | — for uncontrollable vomiting ... | I. 343 |
| — length of | II. 39 | Tapping, <i>cf.</i> also Puncture. | |
| — rupture of | II. 79, 322 | — of hydrocephalic skull | II. 168 |
| — steepness of | II. 39 | — of ovarian cyst | I. 406, II. 153 |
| Synchondrosis, <i>cf.</i> Articulation. | | — of uterus | I. 396, 415 |
| Synchondrotomy | II. 623 | Tar water, <i>cf.</i> also Aqua picis. | |
| Syncope, <i>cf.</i> Collapse. | | Tar water in skin affections | I. 346 |
| Synostosis, <i>cf.</i> also Ankylosis. | | Tardieu, spots of | II. 360 |
| — of ilio-sacral joint | II. 93, 98 | Tarnier, bags of | II. 10 |
| Synostotic pelvis | II. 93, 105 | — bags of, for hemorrhage | I. 533 |
| — — <i>cf.</i> also Robert, Naegele, pelvis of. | | — bags of, in eclampsia | II. 224 |
| Syphilis accompanied by hydrannios | I. 462 | — forceps of | II. 556, 563 |
| — causing abortion | I. 509 | — forceps of, bibliography | II. 579 |
| — causing death of foetus | I. 491, 497 | — uterine dilator of | II. 496, 499, 500, 501 |
| — causing detachment of epiphyses | I. 484 | Taste, perverted, in pregnancy ... | I. 488 |
| — causing endometritis | I. 410, 411 | — sense of, in new-born child ... | I. 315 |
| — causing hemorrhage | I. 496 | Taxis, in inversion of uterus | II. 269 |
| — causing pemphigus | I. 491 | Tea, chamomile | II. 248 |
| — causing peritonitis | I. 492 | — Russian | I. 324, II. 244 |
| — conveyed through milk | I. 321 | — St. Germain's | I. 319 |
| — during pregnancy | I. 351, 364 | Tears of parturient canal, <i>cf.</i> Rupture. | |
| — during pregnancy, bibliography | I. 371 | Teat, india-rubber, for sore nipple | II. 402, 403 |
| — effect on bones | I. 491, 494 | Temperature during protracted labour | II. 79 |
| — — chorionic villi | I. 474 | — during puerperal fever | II. 451, 452, 453 |
| — — cord | I. 481 | — during puerperal state | I. 288, 301 |
| — — foetus | I. 491 | — high, causing death of foetus | I. 351, 497 |
| — — intestines | I. 491, 494 | — maternal, increased during pains | I. 178 |
| — — liver | I. 491, 493, 496 | — of foetus | I. 135 |
| — — lungs | I. 491, 492, 496 | — of new-born child | I. 314 |
| — — pancreas | I. 491, 493 | — of uterus raised during pains ... | I. 179 |
| — — placenta | I. 471, 474 | — of uterus raised during pregnancy | I. 157 |
| | | — of vaginal irrigations | II. 238 |

- Tenaculum** due to inversion of uterus II. 264
— due to retroversion of gravid uterus ... 1. 389
- Tents**, *cf.* also Sponge, Tupelo, Laminaria.
— for dilatation of cervix ... 11. 246
— for induction of labour... 11. 496, 498, 499, 503
— in treatment of atresia ... 11. 139
— laminaria, *cf.* Laminaria.
— sponge, *cf.* Sponge.
— tupelo ... 1. 523, 546, 11. 499, 503
- Terror** causing abortion ... 1. 509
- Testicle**, descent of ... 1. 119, 122
— retained, causing dystocia ... 11. 170
- Test-tubelike glands** of uterus ... 1. 49
- Tetanic constriction** of lactus by uterus 11. 21,
186, 192
- Tetanus** after abortion ... 1. 517
— puerperal... 11. 482
— puerperal, bibliography ... 11. 483
— puerperal, treatment ... 11. 483
— uterine ... 11. 20, 186, 193
- Tetany**, puerperal ... 11. 482
- Thigh**, presentation of ... 11. 194
— straddling, during pregnancy ... 1. 82
- Thiry**, observations of, on ovum ... 1. 63
- Thorax**, *cf.* also Pleurisy.
— crushing of ... 11. 597
— emphysema of ... 11. 19
— how affected by pregnancy ... 1. 86
- Three-plane suture** ... 11. 318
- Thru**, *cf.* Souttle.
- Thrombosis**, abnormal ... 11. 232
— artificial production of ... 11. 235
— cardiac ... 11. 353
— *cf.* also Thrombus.
— checking hæmorrhage ... 11. 228
— due to marasmus ... 11. 353
— in puerperal fever ... 11. 443
— of femoral veins ... 11. 383
— of legs, venous ... 11. 382
— of legs, venous, *cf.* also Phlegmasia.
— of pelvic veins ... 11. 383
— of placenta ... 1. 468
— of placental area ... 11. 185
— of pulmonary system, *cf.* Pulmonary.
— of uterine sinuses ... 1. 536, 11. 7
— of uterine sinuses, imperfect ... 11. 378
— venous, bibliography ... 11. 389
- Thrombus**, *cf.* also Thrombosis.
— detachment of ... 11. 352
— of cervix ... 11. 320
— of pulmonary artery, *cf.* Pulmonary.
— of vagina ... 11. 314
— of vagina, bibliography ... 11. 327
— of vagina, causes ... 11. 315
— of vagina, frequency ... 11. 315
— of vagina, treatment ... 11. 319
— of vulva... 11. 314, 316, 327
- Thymus**, syphilitic changes in 1. 491, 492
- Thyroid** affected in puerperal fever ... 11. 447
— enlargement of, *cf.* Goitre
- Thyroid**, swelling of, during pregnancy 1. 5,
11. 62
- Toilette** of peritoneum ... 11. 62
- Tone**, venous, diminished by ergot ... 11. 15
- Tonic retraction** of uterus ... 11. 22
- Tonus**, muscular, in asphyxia 11. 365, 366
- Torsion** of cord ... 1. 113, 47
— of cord, effect on Wharton's jelly 1. 48
— of cord, recurrence of ... 1. 48
- Torticollis** after difficult extraction... 11. 546
- Touch**, vaginal, *cf.* Examination
- Toughness**, undue, of membranes 11. 198, 22
- Trachea**, catheterisation of ... 11. 365, 366
— catheterisation of, bibliography 11. 371
— compression of, causing asphyxia 1. 491
- Tract**, genital, *cf.* also Genitive, Par-turient ... 1. 26
- Traction**, definition of ... 11. 571
— direction of, in forceps extrac-tions ... 11. 571
— mode of applying ... 11. 571
— on cord causing inversion ... 11. 26
— on jaw in delivery of head 11. 537, 538
— on neck in delivery of head 11. 537, 538
— on placenta causing inversion... 11. 26
- Transfusion** ... 11. 538
- Transfusion** after hæmorrhage ... 11. 247
— bibliography ... 11. 247
— in pernicious anemia ... 1. 32
— modus operandi ... 11. 24
— value of ... 11. 24
- Transmission** of chorea to fetus ... 1. 166
— of syphilis to fetus ... 1. 366
— of variola to fetus ... 1. 353, 11. 47
- Transverse diameter** of brim... 1. 12, 11. 6
— of fetus ... 1. 128, 205
— presentation 1. 205, 11. 99, 178, 184, 69
— diagram ... 11. 179, 179
— embryotomy in ... 11. 69
— frequency ... 1. 205, 11. 18
— prognosis ... 11. 19
— rectification ... 11. 190, 191
— treatment ... 11. 19
— varieties of ... 11. 17
— version from ... 11. 511
— with pelvic contraction 11. 69, 77, 9
- Transversely contracted**, kyphotic pelvis ... 11. 166
— contracted pelvis ... 11. 166
— contracted pelvis, bibliography 11. 131
- Traube** on celanpus ... 11. 345
- Traumatic diseases** ... 11. 420
— fever ... 11. 420, 421
- Treading movements** in pelvic pre-sentations ... 1. 23
- Trefurt**, forceps of ... 11. 50
— porte-fillet of ... 11. 50
- Trepan** ... 11. 58
- Trepine** ... 11. 586, 587, 589, 590
— Leisnig's ... 11. 58
— Lajoy's ... 11. 58
- Trichomonas vaginalis** in lechia ... 1. 97

	PAGE		PAGE
Trimethylamin	1, 414	Tumours, osseous, <i>cf.</i> Exostoses.	
Triplets	1, 270, 273, 277, 286	— ovarian, bibliography ...	11, 159
— diagnosis of	1, 279	— ovarian, <i>cf.</i> also Ovarian	11, 152
— management of	1, 286	— pelvic	11, 128, 133, 159
— usually immature	1, 286	— sculp, <i>cf.</i> Caput.	
— velamentous insertion with ...	1, 476	Tunica albuginea of ovary ...	1, 53, 59
Tri-radiate pelvis	11, 112	— granulosa... ..	1, 132
— pelvis, bibliography	11, 133	— media	1, 101
— pelvis, figures	11, 115, 119	— propria of ovary... ..	1, 60
— rachitic pelvis	11, 45, 112, 118	Tupelo tents	1, 523, 546, 11, 499, 503
Trochanter in new-born child ...	1, 325	— tents, <i>cf.</i> also Tents.	
Trochanters, distance between ...	1, 15	Turning, <i>cf.</i> Version.	
— width across	11, 35	Turpentine in eclampsia ...	11, 222
Trousseau, on phlegmasia alba dolens	11, 385, 389	— stupor	11, 475
— on tetany	11, 432	Twin labours	1, 270
Trunk, delivery of, in breech presentation	1, 240	— labours, bibliography ...	11, 236
— delivery of, in head presentations	1, 201, 211	Twins, causing transverse presentation	11, 180
— extraction of	11, 532	— conjoined... ..	11, 172
— injuries to, during extraction ...	11, 547	— conjoined, bibliography ...	11, 203
— presentations	11, 173	— delay between birth of... ..	1, 285
— presentations, <i>cf.</i> also Transverse.		— delivery of	1, 281, 282
Tubal pregnancy	1, 419, 422	— development of, from ovum ...	1, 271
— pregnancy, bibliography ...	1, 420, 504	— diagnosis of	1, 277
— pregnancy, terminations ...	1, 425	— different fate of	1, 271
Tube, Eustachian, air in	11, 361	— early expulsion of one of ...	1, 271, 279
— Eustachian, air in, bibliography	11, 373	— effect on after-pains	1, 299
— Fallopian, <i>cf.</i> also Fallopian	1, 33, 36, 52	— expulsion of placenta with ...	1, 279
Tuberculosis, contra-indication to marriage	1, 363	— flaccidening of one of	1, 274, 275
— during pregnancy	1, 351, 362	— hemorrhage after birth of ...	1, 285
— in lying-in woman	1, 321	— in extra-uterine pregnancy ...	1, 435
Tuberosities, ischial, distance apart ...	1, 13, 11, 40	— inertia due to	1, 279, 11, 5
Tubo-ovarian pregnancy	1, 422, 429	— interlocking of	1, 282
— ovarian pregnancy	1, 429	— interlocking of, figure	1, 283
— uterine pregnancy	1, 422, 427	— ligation of cord with	1, 231
Tumours, bibliography	1, 417, 418, 11, 133, 203	— management of	1, 234
— cancerous, obstructing delivery	11, 149	— premature delivery of	1, 279
— causing dystocia, <i>cf.</i> also Cesarean section,		— presentation of	1, 230
— causing invagination of uterus ...	11, 244	— prognosis of labours with ...	1, 284
— causing pelvic deformity	11, 123	— relative position of	1, 230
— <i>cf.</i> Fibroid, Myoma, Cancer		— unequal development of ...	1, 271
— complicating pregnancy	1, 398	— use of forceps with	1, 284
— fibroid, <i>cf.</i> also Fibroid.		— usual size of	1, 273
— fibroid, obstructing delivery ...	11, 143	— uterine inertia with	1, 279, 11, 5
— milk, <i>cf.</i> also Galactocele	11, 411	— velamentous insertion with ...	1, 176
— obstructing delivery	11, 143, 149, 170	Twisting of cord, excessive, <i>cf.</i> Torsion.	
— of fetus	11, 165, 169, 170, 171	— at cord round fetus, <i>cf.</i> Coiling.	
— of fetus, bibliography	11, 203	— of fetus during labour... 1, 200, 201, 240	
— of placenta	1, 472	— of pedicle of cyst	1, 407
— of scalp, <i>cf.</i> Caput succedaneum.		Two-horned uterus favouring trans-	
— of uterus	1, 393, 402	verse presentation	11, 181
— of uterus, bibliography... ..	1, 417	Tympanic cavity, air in	11, 361, 373
— of uterus, causing face presentation	1, 222	Typanites uteri	11, 314
— of uterus, causing rupture	11, 293	— uteri, bibliography	11, 319
		— uteri, treatment	11, 346, 348
		Typhoid fever in pregnant woman ...	1, 375
		Typhus, puerperal	11, 444
		U.	
		Ulcer of cervix causing hemorrhage	11, 342
		— of nipple	11, 401
		— syphilitic, causing stenosis ...	11, 137

- | | PAGE | | PAGE |
|--|-----------------|---|----------------------|
| Ulcers, puerperal | 11. 135 | Umbilical cord, rupture of, bibli- | |
| — puerperal, treatment | 11. 174 | — graphy | 11. 301 |
| Umbilical arcuola | 1. 88 | — rupture of, in precipitate | |
| — arteries ... 1. 93, 108, 113, 136, 309, 482 | | — labour | 11. 18 |
| — arteries, atheroma of | 1. 480 | — sheath of ... 1. 112, 475, 476, 11. 329 | |
| — artery, absence of one | 1. 482 | — short | 1. 477, 11. 201, 202 |
| — bandage for new-born child ... | 1. 325 | — short, bibliography | 11. 203 |
| — cord ... 1. 91, 112, 121, 475, 11. 201 | | — short, causing pelvic presen- | |
| — — abnormal insertion of ... 1. 475 | | — tation | 1. 178 |
| — — adhesions of amnion to ... 1. 481 | | — short, treatment | 11. 202 |
| — — anomalies of | 1. 475, 11. 201 | — soufflé in | 1. 143, 146, 147 |
| — — arteries of ... 1. 93, 108, 113, 136, 309, | | — structure of | 1. 112 |
| 480, 482, 11. 329 | | — traction on, causing inversion 11. 202 | |
| — — atheroma of | 1. 475, 480 | — tying the ... 1. 262, 270, 284, 11. 368 | |
| — — attached remnant of ... 1. 310, 325 | | — undue shortness of 1. 475, 478, 11. 201 | |
| — — avoidance of pressure on ... 11. 343 | | | 202 |
| — — bibliography ... 1. 138, 505, 11. 203 | | — — undue shortness of, bibli- | |
| — — calcareous degeneration of | | — graphy | 11. 203 |
| — arteries of | 1. 475, 480 | — — undue shortness of, treat- | |
| — — care of, after exit of head ... 1. 260 | | — ment | 11. 302 |
| — — changes in, after death of | | — values of | 1. 111 |
| — foetus | 1. 500 | — varieties of rupture | 11. 329 |
| — — circulation in | 1. 136 | — — velamentous insertion of 1. 115, 202 | |
| — — coiling of, round foetus 1. 260, 477, | | 280, 478 | |
| 11. 162, 201, 261 | | — — velamentous insertion of, of | |
| — — cysts of | 1. 481 | — also Velamentous | |
| — — diagnosis of prolapsed ... 11. 334 | | — hernia | 1. 381, 482 |
| — — division of | 1. 262 | — hernia, bibliography | 1. 505 |
| — — early ligation of 1. 262, 270, 11. 368 | | — pulse, cessation of | 1. 263 |
| — — effect of syphilis on | 1. 475, 481 | — sheath ... 1. 112, 475, 476, 11. 329 | |
| — — effect on position of child 1. 132, 478 | | — soufflé | 1. 143, 146, 147 |
| — — excessive torsion of | 1. 478 | — vein | 1. 93, 114, 136, 309 |
| — — figures of | 1. 112, 479 | — vein, constriction of | 1. 480 |
| — — fork-shaped | 1. 273 | — vesicle | 1. 31, 91 |
| — — frequency of prolapse ... 11. 331 | | — vesicle, double | 1. 272 |
| — — hemorrhage from | 11. 330 | — vessels, hæmorrhage from ... 11. 296 | |
| — — hernia of | 1. 482 | — — occlusion of | 1. 480, 501 |
| — — in breech presentation ... 1. 248 | | — — presentation of | 11. 296 |
| — — knots of ... 1. 114, 115, 476 | | — — presentation of, bibliography 11. 258 | |
| — — laceration of | 11. 18, 328 | — — stenosis of | 1. 480, 501 |
| — — laceration of, bibliography ... 11. 344 | | Umbilicus | 1. 92 |
| — — length of | 1. 114 | — affected by pregnancy | 1. 155 |
| — — ligation of | 1. 262, 11. 368 | — of, also Umbilical cord. | |
| — — ligation of, bibliography ... 1. 270 | | — dragging out of | 1. 480 |
| — — ligation of, with twins ... 1. 281 | | — infection starting at | 11. 158 |
| — — marginal insertion of ... 1. 475 | | Unavoidable hæmorrhage | 1. 508 |
| — — marginal insertion of, in | | Unconsciousness after delivery ... 11. 349 | |
| — placenta prævia | 1. 541 | — due to apoplexy | 11. 248 |
| — — mode of detachment from | | — due to eclampsia | 11. 206, 207 |
| — infant | 1. 310 | Uncontrollable vomiting, cf. Vomiting 1. 341 | |
| — — modes of insertion | 1. 115 | Unclaus | 1. 93, 196 |
| — — modes of insertion, cf. also | | Uremia | 1. 391 |
| — Insertion. | | — in eclampsia | 11. 204, 213, 217 |
| — — pathology of | 1. 475, 11. 201 | Uretes in new-born children ... 1. 312 | |
| — — presentation of | 11. 330, 337 | Urea during pregnancy | 1. 87 |
| — — pressure on ... 1. 245, 248, 11. 331, | | — in blood increased during | |
| 335, 358, 505 | | — eclampsia | 11. 214 |
| — — prolapse of | 11. 89, 330 | — in liquor amni | 1. 163 |
| — — prolapse of, bibliography ... 11. 344 | | — production of, by foetus ... 1. 133 | |
| — — prolapse of, requiring version 11. 512 | | — retention of, in eclampsia ... 11. 211 | |
| — — reposition of prolapsed ... 11. 337 | | Ureters | 1. 82 |
| — — rupture of | 11. 18, 328 | — atresia of, in foetus | 11. 602 |
| | | — atresia of, in foetus, bibliography 11. 162 | |

- | | PAGE | | PAGE |
|--|-----------------------------------|--|--------------------------------------|
| Urethra | I. 38, 80 | Uterine segment, lower, <i>cf.</i> also Lower segment. | |
| — affections of, post partum ... | II. 390 | — sinuses | I. 68, 110 |
| — dilatation of | II. 140, 394 | — sinuses, <i>cf.</i> also Sinuses. | |
| — flexure of, after delivery ... | II. 394 | — suture | I. 143, 144, 136 |
| — injuries to | II. 304 | — suture, bibliography | I. 166 |
| — of fetus, imperforate | II. 169 | — tumours, <i>cf.</i> Tumours, Fibroid, &c. | |
| — plugging of | II. 394 | Utero-placental apoplexy | I. 468 |
| Urethral thickening in vagina ... | I. 77, 163, 183 | Uterus | I. 30, 31, 48, 67 |
| Urethro-vaginal septum | I. 39 | — abnormalities of | I. 373, 374, II. 5, 134, 181 |
| — septum, injury to | II. 567 | — adhesion of fetus to | II. 177 |
| Uric acid infarct in new-born child ... | I. 133, 312 | — adhesion of placenta to | II. 243, 251 |
| Urinary affections after labour ... | II. 390 | — antelexion of gravid | I. 383 |
| — affections during pregnancy ... | I. 345 | — anteversion of gravid | I. 383 |
| — affections during pregnancy, bibliography | I. 350 | — areolatus | I. 374 |
| — calculus, <i>cf.</i> Calculus. | | — areolatus, causing transverse presentation | II. 181 |
| — passages | I. 38 | — arteries of | I. 50, 67 |
| Urine, albumin in, <i>cf.</i> Albuminuria, Nephritis. | | — artificial inversion of | II. 262 |
| — characters of foetal | I. 103, 133 | — atony of, <i>cf.</i> Atony. | |
| — chloroform in | I. 268 | — atresia of | II. 134 |
| — condition of, in hydræmia ... | I. 337 | — atresia of, bibliography | II. 159 |
| — during eclampsia | II. 208, 211 | — axis of | I. 31, 32 |
| — during pregnancy | I. 87 | — axis of, abnormal | II. 249 |
| — during puerperal state | I. 290, 307 | — bicornis | I. 373 |
| — incontinence of | II. 396 | — bicornis, causing transverse presentation | II. 181 |
| — — due to fistula | II. 302 | — bifolcularis | I. 374 |
| — — during pregnancy | I. 80 | — bimammal compression of | II. 237 |
| — kistine in | I. 87 | — body of | I. 32 |
| — of fetus | I. 103, 133 | — bruit of | I. 143, 144, 436 |
| — of new-born child | I. 311 | — cancer of, <i>cf.</i> Cancer. | |
| — retention of, during labour ... | I. 254, II. 156 | — capacity for work | I. 191, II. 67 |
| — — during pregnancy | I. 80, 163 | — capacity of gravid | I. 68 |
| — — during puerperal state ... | I. 291, 319, II. 394 | — catheterisation of | II. 10, 224, 496, 499, 500, 501, 503 |
| — — — owing to incarceration of uterus | I. 389 | — centre for contractions of | I. 172 |
| — secretion of, during puerperal state | I. 290 | — cervix of, <i>cf.</i> also Cervix. | I. 32, 49 |
| — — increased during pains ... | I. 179 | — change in position during pregnancy | I. 69 |
| — sugar in, <i>cf.</i> also Diabetes. | | — change in shape during pregnancy | I. 69, 70 |
| — sugar in, during pregnancy ... | I. 87 | — complete development of | I. 62 |
| — sugar in, during puerperal state ... | I. 290 | — complete rupture of | II. 277 |
| — suppression of, in eclampsia ... | II. 213 | — condition of, after delivery ... | I. 297 |
| Uro-genital organs | I. 91 | — condition of, before rupture, diagrams | II. 274 |
| — region, figure | I. 27 | — contractions of, anomalies of ... | II. 3, 5, 16, 20 |
| Uterine atony, <i>cf.</i> Atony. | | — — — causing detachment of placenta | I. 529 |
| — braut | I. 113, 144 | — — — <i>cf.</i> also Pains. | |
| — contractions, <i>cf.</i> Uterus, contractions of, Pains. | | — — — during labour | I. 175, 176, 180, 183, 184 |
| — douche, <i>cf.</i> Irrigations. | | — — — during pregnancy | I. 69, 156 |
| — glands | I. 49 | — — — effect of chloroform on ... | I. 266, 270 |
| — glands after delivery | I. 294 | Uterus, corrosion of, by hemostatics ... | II. 288 |
| — hæmorrhage, <i>cf.</i> Hæmorrhage. | | — deposit of pigment on | I. 307 |
| — inertia, <i>cf.</i> Inertia. | | | |
| — mucosa | I. 49, 50, 67 | | |
| — mucosa, at delivery | I. 293 | | |
| — mucosa, during pregnancy ... | I. 67 | | |
| — mucosa, reconstruction of ... | I. 293 | | |
| — segment, lower | I. 75, 528, 531, II. 64, 270, 275 | | |

- | | PAGE | | PAGE |
|---|----------------------------|--|---------------------|
| Uterus, descent of, after delivery | 11. 394 | Uterus inertia of, sequelæ | 11. 6 |
| — detachment of | 11. 298, 299 | — treatment | 11. 18 |
| — detachment of placenta from | 11. 253, 255 | — with contracted pelvis | 11. 65, 66, 87 |
| — deviation of axis causing retention of placenta | 11. 249 | — with placenta prævia | 1. 548 |
| — didelphys... | 1. 373 | — inflammation of... | 1. 391 |
| — dimensions of gravid | 1. 68 | — inflammation of, cf. also Metritis. | |
| — disinfection of | 11. 468 | — injection of, for inducing pains | 11. 496, 499 |
| — displacements of gravid | 1. 377, 381, 383, 386 | — injured by forceps | 11. 566 |
| — distention of, in fetus | 11. 169 | — insufficient contraction of | 11. 290 |
| — drainage of | 11. 621 | — internal surface of, during childbirth | 1. 293, 307 |
| — drainage of, cf. also Drainage. | | — introduction of hand into | 11. 287 |
| — duplex | 1. 274, 373 | — inversion of | 11. 259 |
| — duplex didelphys | 1. 373 | — — active | 11. 265 |
| — duplex separatus | 1. 373 | — — after abortion | 1. 517 |
| — effect of, on diaphragm | 1. 72 | — — bibliography | 11. 260, 262, 264 |
| — enlargement of, during pregnancy | 1. 68, 155 | — — causes | 11. 260 |
| — evacuation of, in abortion | 1. 522, 525, 526 | — — causing atony | 11. 245 |
| — excitation of | 11. 9, 495, 496 | — — diagnosis | 11. 266 |
| — exhaustion of, causing atony | 11. 284 | — — diagrams of | 11. 259 |
| — extirpation of | 11. 147, 151, 621 | — — due to myoma | 11. 144 |
| — extirpation of, bibliography | 11. 624 | — — due to traction on cord | 11. 262 |
| — fibroid of | 11. 143 | — — due to traction on placenta | 11. 262 |
| — fibroid of, bibliography | 11. 159 | — — due to tumour | 1. 100, 11. 260 |
| — fibroid of, causing dystocia | 11. 143, 147 | — — frequency | 11. 260 |
| — fibroid of, cf. also Fibroid, Myoma. | | — — prognosis | 11. 265 |
| — fibroid of, figures | 11. 146 | — — sequelæ | 11. 264 |
| — friction of, in inertia | 11. 9 | — — spontaneous reposition | 11. 265 |
| — ganglia of | 1. 68, 174 | — — symptoms | 11. 265 |
| — glands of | 1. 49, 294 | — — treatment | 11. 267 |
| — gravid, displacements of, cf. Retroversion, Prolapse, &c. | | — — varieties of | 11. 259 |
| — gravid, incarceration of | 1. 380, 383, 389, 394, 396 | — — with prolapse | 11. 259 |
| — — after 28th week | 11. 226, 378 | — involution of | 1. 292, 293, 296 |
| — — cf. also Hemorrhage. | 1. 528 | — involution of, after abortion | 1. 517 |
| — — during pregnancy | 1. 505 | — isthmus of | 1. 48, 11. 257 |
| — — prevention | 11. 234 | — lacerations of | 11. 250 |
| — — treatment | 11. 234 | — lacerations of, cf. Ruptures. | |
| — hernia of | 1. 381 | — lateral deviation of, cf. Inclination. | |
| — hernia of, bibliography | 1. 417 | — length of, after delivery | 1. 298 |
| — hernia of, cf. also Hernia. | | — ligaments of | 1. 36 |
| — hour-glass contraction of | 11. 247 | — literature of | 1. 57 |
| — imperfect retraction of | 11. 378, 379 | — lower segment of | 1. 75, 176, 192 |
| — in extra-uterine pregnancy | 1. 436 | — — cf. also Lower segment. | |
| — in puerperal fever | 11. 437, 438 | — lymph lacunæ of | 1. 69 |
| — incarcerated, with antelexion | 1. 383 | — lymphatics of | 1. 51, 67 |
| — incarcerated, with hernia | 1. 383 | — measurements of gravid | 1. 68 |
| — incarcerated, with prolapse | 1. 380 | — motor centre for | 1. 172, 174 |
| — incarcerated, with retroversion | 1. 389 | — mucosa of | 1. 48, 50, 87 |
| — inclination of, to right | 1. 40, 71, 76 | — mucosa of, at time of labour | 1. 294 |
| — incomplete rupture of | 11. 286 | — mucosa of, during menstruation | 1. 61 |
| — increased mobility in contracted pelvis | 11. 59, 65 | — mucosa of, post partum | 1. 293 |
| — increased size of, in pregnancy | 1. 68 | — muscularis of | 1. 48, 61 |
| — inertia of | 11. 1, 5, 6 | — myoma of, cf. Fibroid. | |
| — inertia of, causes | 11. 6, 7 | — neck of, cf. Cervix. | |
| | | — nerves of | 1. 51, 68, 172, 174 |
| | | — neuralgia of | 11. 376 |
| | | — occlusion of | 11. 134 |
| | | — occlusion of fetal | 11. 163 |
| | | — one-horned, cf. Uterus unicornis | 1. 373 |

	PAGE
Uterus, os of	1. 31
— os of, <i>cf.</i> also Os.	
— paralysis of	11. 22
— passive inversion of	11. 261
— pendulous	1. 168, 384
— pendulous, in contracted pelvis	11. 59
— pendulous, treatment	1. 168
— plugging of, for hemorrhage ...	11. 239
— polypus of	1. 401
— polypus of, <i>cf.</i> also Polypus.	
— polypus of, during labour	11. 148
— position of	1. 32
— — — affected by posture	1. 70, 71
— — — <i>cf.</i> Prolapse, Hernia, &c.	
— post-partum condition of	1. 305
— pressure on, in hemorrhage	11. 237,
	239, 240
— prolapse of, during pregnancy ...	1. 377
— prolapse of, with inversion	11. 259
— puerperal, bibliography	1. 307
— puerperal, displacement of	1. 317
— puerperal, involution of	1. 292, 297, 317
— puncture of	1. 396
— removal of, by Porro's operation ...	11. 147,
	621, 624
— removal of, for cancer	11. 151
— removal of ruptured	11. 286
— retraction of, after delivery	1. 192
— retraction of, <i>cf.</i> also Retraction.	
— retroflexed, <i>cf.</i> Retroflexion.	
— retroverted, <i>cf.</i> Retroversion.	
— rheumatic affections of	1. 409, 11. 6
— rigidity of	11. 22
— rubbing through of	11. 78, 271, 273, 291
— rupture of	1. 415, 11. 270, 271, 277, 286
— — — bibliography	1. 415, 418, 11. 327
— — — <i>cf.</i> also Rupture.	
— — — diagnosis	1. 416, 11. 279, 287
— — — diagram	11. 276
— — — due to hydrocephalus	11. 167
— — — due to myoma	11. 144
— — — frequency	11. 271
— — — in pelvic contraction	11. 64, 78
— — — prognosis	11. 280
— — — prophylaxis	11. 282
— — — recovery after, biblio-	
— — — graphy	11. 281
— — — symptoms	1. 416, 11. 279, 287
— — — treatment	1. 416, 11. 282, 290
— — — varieties of	11. 277
— septus	1. 374
— sinuses of	1. 68, 110
— sinuses of, thrombosis of	11. 7
— size of	1. 32
— size of gravid	1. 68
— size of virgin	1. 32, 68
— souffle of	1. 143, 144, 166
— souffle of, in extra-uterine preg-	
— nancy	1. 436
— spasm of	11. 20, 22
— spasm of, bibliography	11. 25
— specific gravity of	1. 80

	PAGE
Uterus, sphincters of	1. 48, 51
— stricture of	11. 20, 22, 246, 257
— — — causes	11. 247
— — — diagnosis	11. 248
— — — treatment	11. 248, 257
— subinvolution of	1. 317, 517
— subperitoneal emphysema of	11. 288
— subseptus	1. 374
— temperature of, during preg-	
— nancy	1. 157
— temperature of, increased by	
— pains	1. 179
— tetanus of	11. 20, 186, 193
— thickness of walls	1. 32, 68
— tonic retraction of	1. 293, 11. 229
— tumours of, causing dystocia	11. 143, 147
— — — of, <i>cf.</i> also Fibroid, Dystocia, &c.	
— tympanites of	11. 344
— tympanites of, bibliography	11. 349
— unicornis	1. 372
— veins of	1. 51, 67, 68
— weight of	1. 32
— weight of gravid	1. 68

V.

Vaccination, intra-uterine	1. 353
Vagina	1. 25, 30, 46
— affected in puerperal fever	11. 435
— anterior and posterior columns	
— of	1. 47
— artificial closure of	11. 141
— atresia of	11. 138, 159, 300
— bibliography	1. 57
— calculus in	11. 156, 157
— cancer of	11. 151
— cancer of, bibliography	11. 151
— changes in, after labour	1. 296, 306
— changes in, during pregnancy ...	1. 77, 155,
	156
— changes in, during puerperal	
— state	1. 296
— columns of	1. 47
— contraction of	11. 140, 141
— corrosion of, by astringents	11. 239
— cystocele of	1. 381, 11. 156, 157
— disinfection of, during labour ...	1. 252, 253
— disinfection of, in puerperal	
— fever	11. 463, 464, 467
— displacement of, during preg-	
— nancy	1. 377
— duplex	1. 373
— emphysema of	1. 414
— enterocele of	11. 154, 159
— expulsive action of	1. 178
— fibroids of	11. 145
— fistule of	11. 301, 303, 327
— fistule of, <i>cf.</i> also Fistula.	
— form of	1. 31
— hematomas of	1. 417, 11. 298, 314, 321
— hematoma of, bibliography	11. 327
— hematoma of, causes	11. 315

- Vagina, hæmatoma of, frequency** ... 11. 315
 — hæmatoma of, treatment ... 11. 319
 — hæmorrhage from ... 1. 506, 11. 305
 — hæma of 11. 151
 — inflammation of, *cf.* Colpitis.
 — injuries to, during labour 1. 260, 11. 61, 78, 296, 299
 — injuries to, during pregnancy ... 1. 117
 — length of 1. 31
 — mucosa of 1. 46
 — unclean of, during pregnancy ... 1. 77
 — occlusion of 11. 138, 159
 — ostium of, *cf.* Labia.
 — perforation of, by tumour 11. 151, 298
 — perforation of, by uterus retroflexus ... 1. 289, 11. 298
 — plugging of, during abortion ... 1. 523
 — — — for hæmorrhage ... 11. 289
 — — — for inducing pains 11. 496, 497
 — — — in inertia of uterus ... 11. 10
 — — — *modus operandi* ... 1. 523
 — polypoid hæmatoma of ... 11. 321
 — post-partum condition of 1. 296, 305, 306
 — prolapse of anterior wall of ... 11. 156
 — prolapse of, during pregnancy 1. 377, 380
 — puerperal involution of ... 1. 296
 — rupture of ... 11. 61, 78, 296, 299
 — rupture of, bibliography ... 11. 327
 — rupture of, during labour ... 11. 296
 — rupture of, treatment ... 11. 299
 — stenosis of ... 11. 138, 159
 — stenosis of, causing rupture ... 11. 300
 — tears at orifice of ... 11. 303
 — thrombus of ... 11. 314
 — thrombus of, bibliography ... 11. 327
 — ulcers of, *cf.* Puerperal ulcers.
 — walls of 1. 46
Vaginal calculus ... 11. 156, 157
 — douches, *cf.* Vaginal irrigations.
 — enterocele 11. 151
 — enterocele, bibliography ... 11. 159
 — examination ... 1. 149, 252, 253
 — examination, post partum ... 1. 305, 317
 — irrigations after delivery 1. 253, 317, 318
 — — *cf.* also Irrigations.
 — — during abortion ... 1. 523, 527
 — — during labour ... 1. 253
 — — during pregnancy ... 1. 169
 — — in inducing premature labour 11. 495, 497
 — — in inertia of uterus ... 11. 9, 10
 — portion, *cf.* Porto vaginalis.
 — pregnancy 1. 134
 — tampon in hæmorrhage 1. 523, 524, 532
Vaginalis portæ *cf.* Porto vaginalis
Vaginosis, *cf.* also Colpitis.
 — granularis 1. 77
 — in puerperal fever 11. 399, 435, 474
Vagino-uteroscope 1. 148
- Vagitus uterinus** 11. 361
Vagus, exhaustion of 11. 366
 — irritation of ... 1. 203, 11. 358, 361
Valve, Eustachian 1. 135, 136
 — of foramen ovale ... 1. 135, 160
Valvular disease during pregnancy ... 1. 374
 — disease, *cf.* also Heart
Variation in size of pelvic outlet ... 1. 41
 — in size of pelvis 1. 12, 27
Varicella syphilitica confluenta ... 1. 491
Varices, death from, during pregnancy 1. 341
 — diminution of, after labour ... 1. 297
 — during pregnancy ... 1. 349, 347
 — hæmorrhage from ... 1. 506, 11. 36
 — of cervix 1. 78, 11. 368
 — of external generative organs ... 1. 81
 — of legs during pregnancy 1. 81, 85, 168, 341
 — of rectum 1. 81
 — of vestibule, causing hæmorrhage ... 11. 366
 — treatment of, by ergotin ... 1. 341
Varicose veins, *cf.* Varicos
Varicella during pregnancy ... 1. 371
 — during pregnancy, bibliography 1. 370
 — in fetus 1. 353
Vas aberrans in fetal membranes ... 11. 224
Vasa prævia funis 11. 226, 227
Vaso-motor nerves in eclampsia 11. 212, 214, 217, 224
Vectis 11. 557
 — aeroductor 11. 556
Vein, circular, of uterus 1. 68
 — coronary, of placenta ... 1. 116
 — umbilical 1. 93, 114, 136, 309, 486
Veins, affected in puerperal fever 11. 443, 444, 453
 — entrance of air into ... 11. 356
 — entrance of air into, bibliography ... 11. 353
 — of legs, thrombosis in ... 11. 382, 383
 — of uterus 1. 51, 67, 68
 — varicose, *cf.* Varices
Veit on extraction of head 11. 537, 538, 546
Velamentous insertion ... 1. 115, 272, 286
 — insertion, causing rupture of umbilical vessels ... 11. 226
 — insertion favouring prolapse of cord ... 11. 332
Veneris mors 1. 37
Venesection in eclampsia 11. 219, 220, 225, 227
 — in plethora of pregnancy ... 1. 346
 — in uterine spasm ... 11. 36
Venosus ductus Aranzi ... 1. 131
 — ductus Aranzi, closure of, at birth 1. 306
Venous septicæmia ... 11. 441, 451, 452
 — septicæmia, *cf.* also Septicæmia, venous.
 — thrombosis of legs ... 11. 385
 — thrombosis of legs, *cf.* also Phlegmasia.

- Venous tone diminished by ergot ... II. 12
 Veratrin as antipyretic ... II. 473
 — in eclampsia ... II. 222
 Vernix caseosa... I. 102, 118, 122
 — caseosa, removal of ... I. 325
 Version ... II. 505
 — after craniotomy ... II. 541
 — after rupture of uterus ... II. 541
 — bibliography ... II. 528
 — bimanual method ... II. 526
 — bipolar ... II. 511
 — Braxton Hicks' method I. 547, II. 511, 513
 — breech ... II. 508
 — Busch's method of ... II. 515, 516
 — causing rupture of perineum ... II. 507
 — cephalic ... II. 505, 506, 511, 513, 515
 — cephalic, with pelvic contraction II. 90
 — combined ... II. 511, 512
 — combined, figures ... II. 523, 526
 — combinations of ... II. 524
 — d'Outrepoint's method of ... II. 515
 — external ... II. 509
 — following perforation ... II. 500
 — for prolapse of cord II. 339, 341, 344, 342
 — from head presentation ... II. 514
 — in breech presentations ... I. 216
 — in brow presentations ... II. 232
 — in head presentations ... I. 219
 — in hydrocephalus ... II. 108
 — in placenta previa ... I. 514
 — in transverse presentations II. 192, 514
 — internal ... II. 515
 — modus operandi... II. 518, 520, 521
 — pelvic ... II. 505, 508, 509
 — podalic ... II. 505, 514, 516
 — podalic, chloroform in ... II. 88
 — podalic, with pelvic contraction II. 87, 88
 — prognosis ... II. 517
 — spontaneous ... II. 184
 — spontaneous, bibliography II. 203
 — with contracted pelvis, bibliography ... II. 132
 — with knee ... II. 520
 Vertebra, supplementary, causing spondylolisthesis ... II. 123
 Vertebrae, cervical, rupture of ... II. 167
 — destruction of, causing spondylolisthesis ... II. 110
 — lumbar, dislocation of ... II. 119
 Vertebral column, *cf.* Spinal column.
 Vertex position, first ... I. 209, 212
 — position, second ... I. 210, 212
 — presentations ... I. 204, 209
 — bibliography ... I. 250
 — caput succedaneum in ... I. 215
 — caput succedaneum in, *cf.* also Caput.
 — diagnosis of ... I. 207, 209
 — frequency of ... I. 205
 Vertex presentations, mechanism of I. 210
 — physical signs of ... I. 209
 — subdivisions of ... I. 210
 Vertigo during pregnancy ... I. 85
 Vesical calculus complicating labour II. 156
 — fistula, how caused II. 292, 301, 567
 — fistula, with pelvic contraction II. 72
 Vesicle, blastodermic ... I. 90
 — blastodermic, in case of twins... I. 272
 — germinal ... I. 54
 — umbilical... I. 91, 94
 — umbilical, double ... I. 272
 Vesico-vaginal fistula ... II. 300, 301
 — fistula, bibliography ... II. 327
 — fistula, *cf.* also Fistula.
 Vesicular mole... I. 451, 452
 — mole, bibliography ... I. 504
 Vessels, *cf.* Artery, Vein, Blood-vessels.
 Vestibule ... I. 29, 46
 — haemorrhage from bulbs of ... II. 305
 — ruptures of ... II. 303, 304, 305
 — varices of... II. 305
 Vibriones, *cf.* also Bacteria, Micro-organisms, Schizo-mycetes.
 — in puerperal fever ... II. 426
 Villi, chorionic ... I. 100
 — chorionic, degeneration of ... I. 451
 — placental ... I. 107
 — placental, degeneration of ... I. 451
 — placental, how affected by syphilis I. 474
 Vinegar ... I. 519, II. 238, 296
 Vinum camphoratum ... II. 320, 474
 Virehow on ichthyaria ... II. 445
 — on parametritis phlegmonosa ... II. 440
 — on parametrium... I. 43
 Virgin, size of uterus in ... I. 68
 Virus of small-pox, transmission to fetus ... I. 353, II. 477
 — of syphilis, transmission to fetus ... I. 364
 — septic, *cf.* Septic.
 Visceral arches ... I. 116
 Viscerum ectopia ... I. 482
 Viscerum ectopia causing dystocia ... II. 170
 Vision, *cf.* also Eyes, Amblyopia, &c.
 — disorders of, during pregnancy I. 349
 — power of, in new-born child ... I. 315
 Vital capacity of lungs during pregnancy ... I. 85
 Vitelline duct ... I. 94
 Vitello-intestinal duct ... I. 92, 112
 — duct, persistence of ... I. 482
 Vitellus... I. 51, 64
 — segmentation of ... I. 90
 Vitus' dance, St., *cf.* Chorea.
 Volition in new-born child ... I. 315
 Volunto-muscular plate ... I. 90
 Vomiting caused by pains ... I. 179
 — due to pregnancy ... I. 86, 341
 — uncontrollable ... I. 341
 — uncontrollable, bibliography ... I. 350

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